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A61G 1/00

(52) UK CL (Edition P )  
A5X X20

(56) Documents Cited  
GB 2182570 A GB 2030047 A WO 81/00672 A1  
US 5473784 A US 4186453 A

(58) Field of Search  
UK CL (Edition P ) A5X X20  
INT CL<sup>6</sup> A61G 1/00 1/003 1/007 1/01 1/02 1/04 1/044  
1/048  
Online: WPI, CLAIMS

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(72) and (74) continued overleaf

(54) Abstract Title

**Emergency evacuation apparatus for a bed-ridden patient**

(57) The apparatus comprises a rigid base tray 1 of a length substantially equal to that of a mattress, wheels, glides, rollers or castors on the tray to facilitate its movement over the floor and straps 6 anchored to the tray for wrapping around the mattress to thereby restrain and cocoon the patient. Lifting handles 3 and lifting straps 5 may be provided and a pulling handle 4 of webbing, or a rigid, extensible handle (10), may also be included. The lifting handles may be of fold-away type and the pulling handle may be auto-retractable.

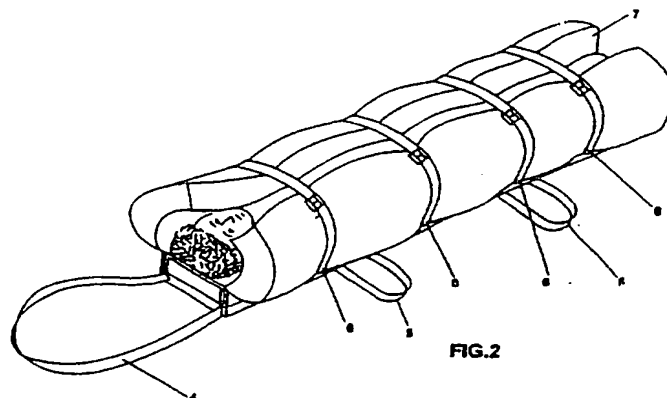


FIG.2

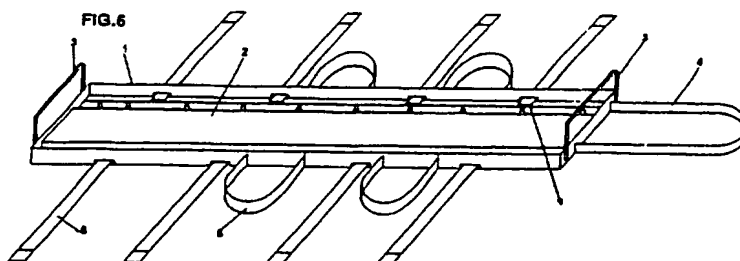


FIG.6

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

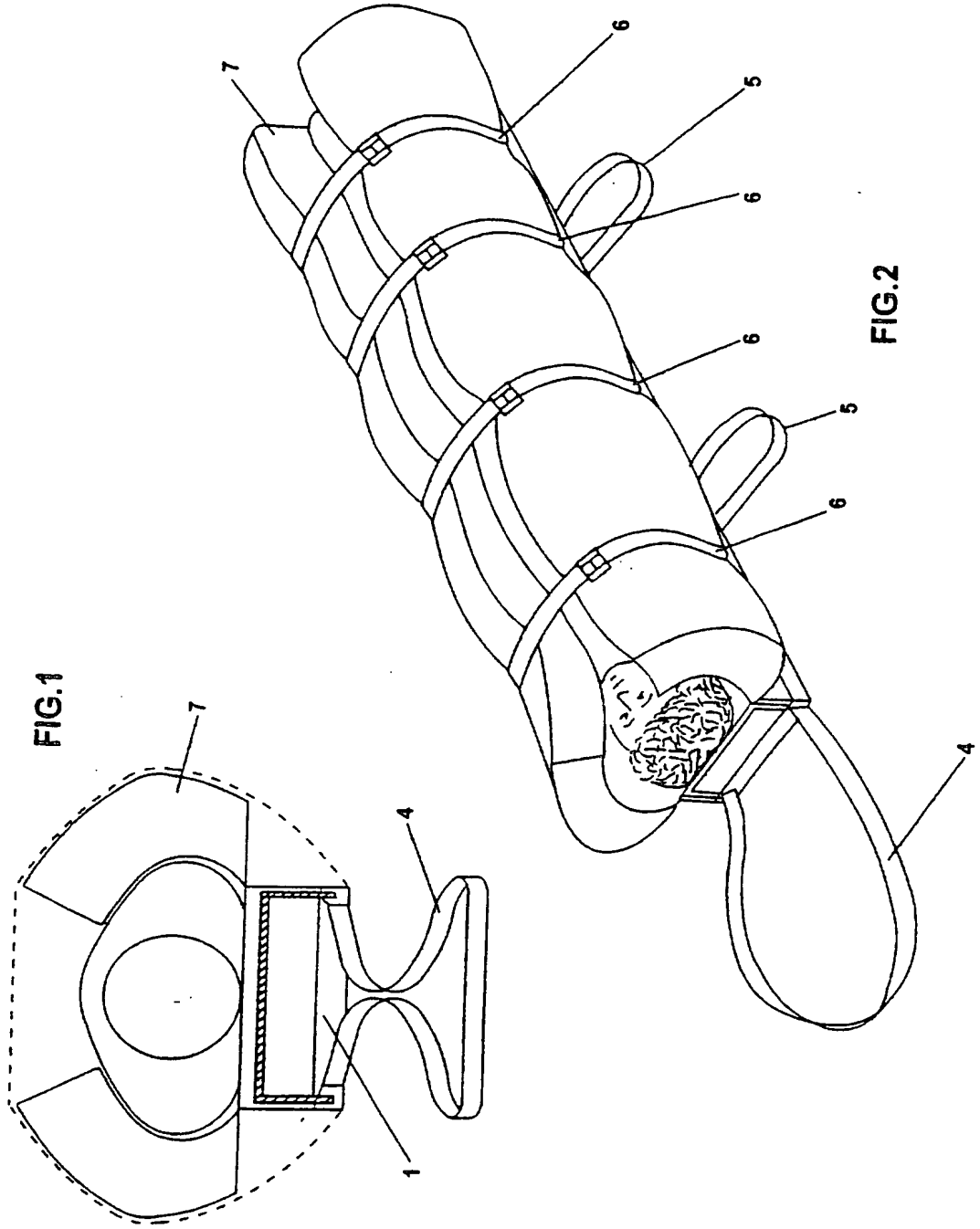
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United Kingdom**



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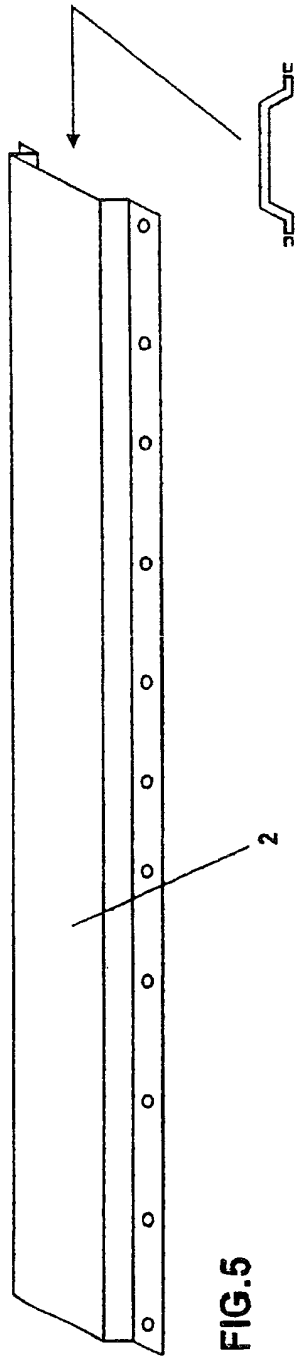


FIG. 5

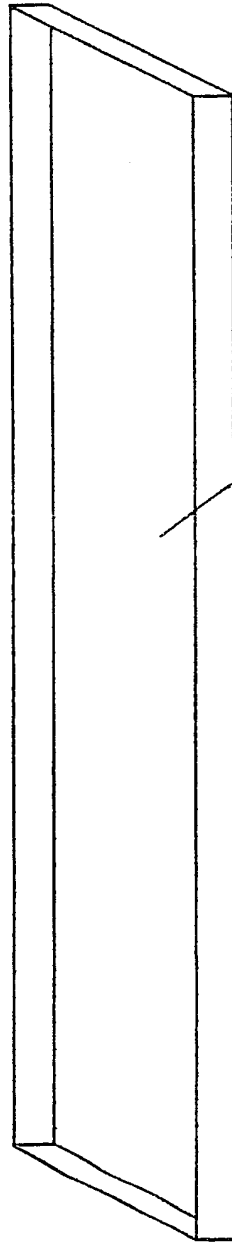


FIG. 4

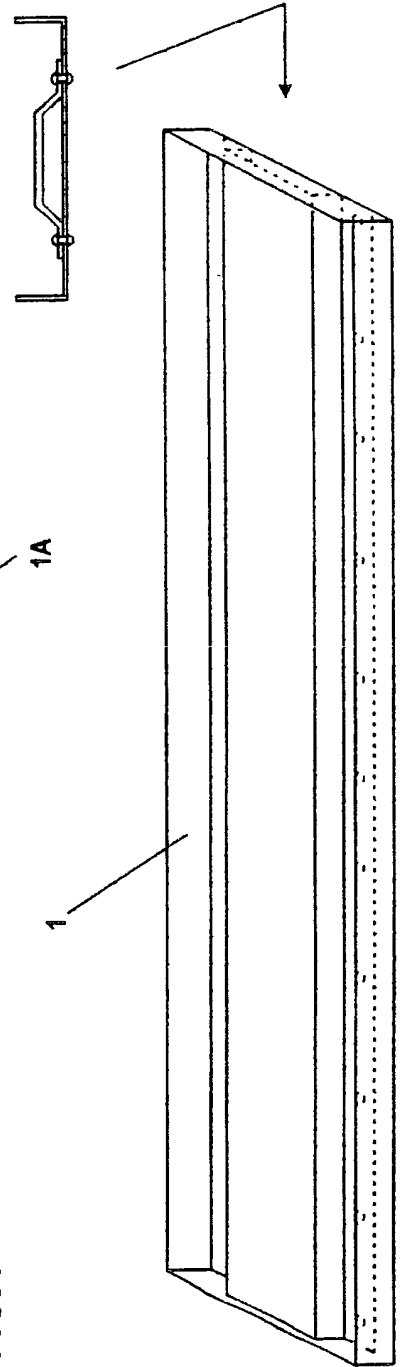


FIG. 3

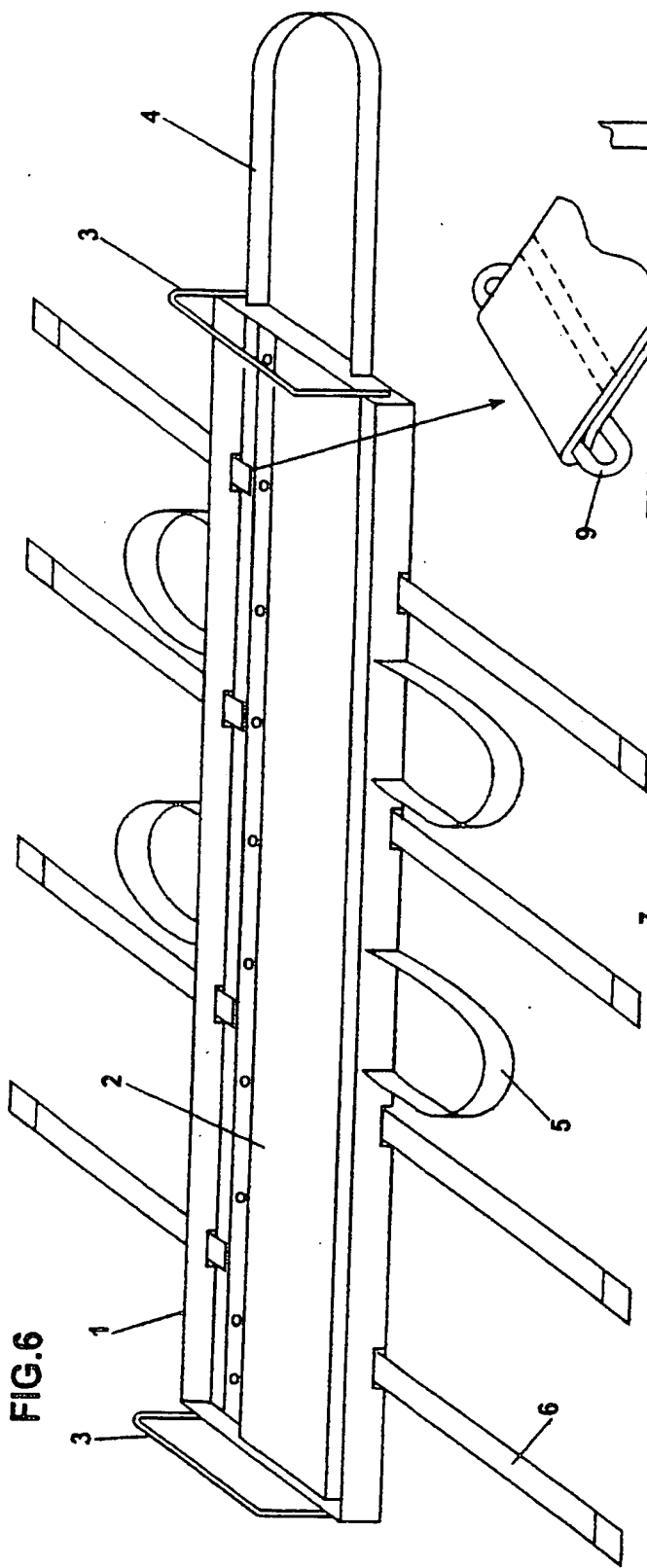


FIG. 6

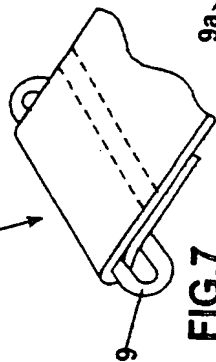


FIG. 7

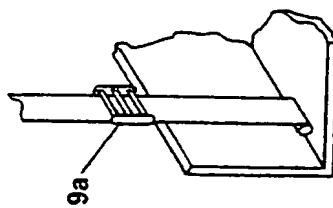


FIG. 7A

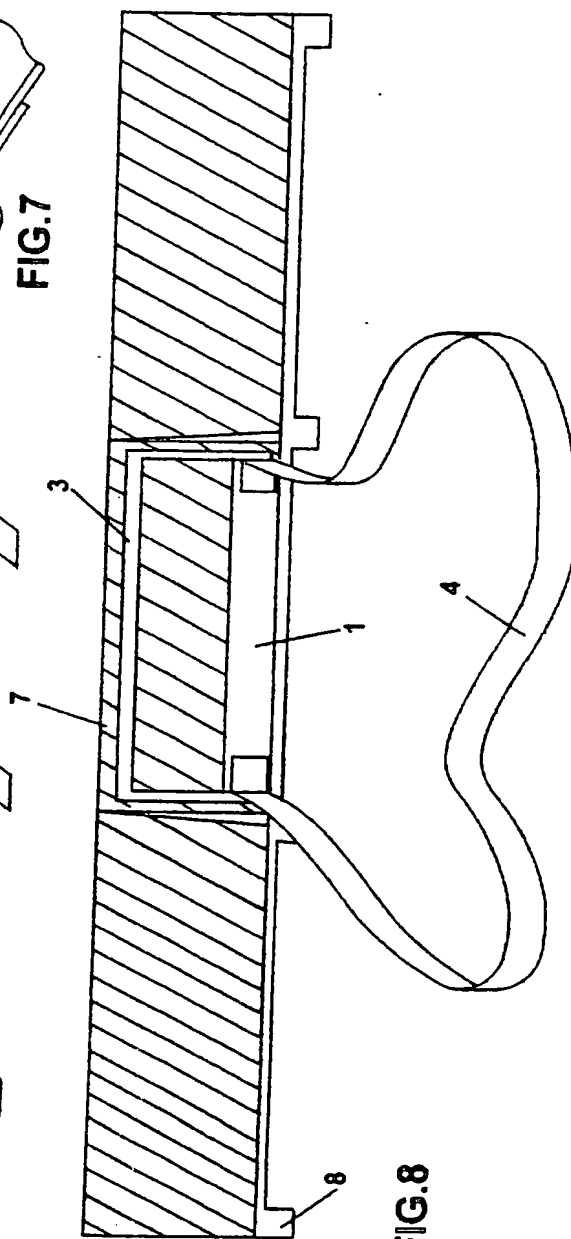


FIG. 8

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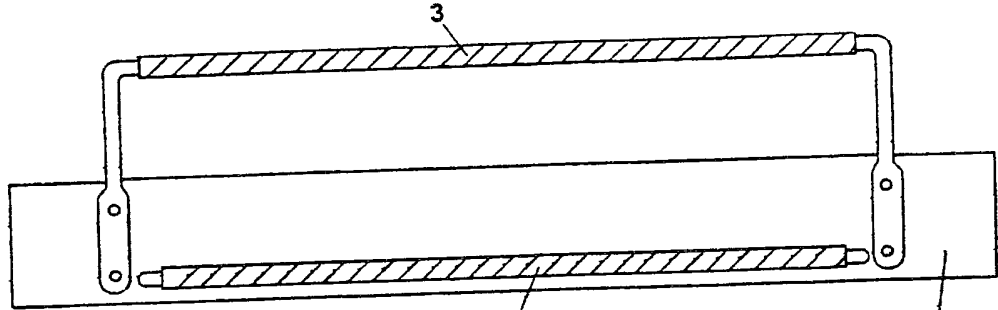


FIG. 9

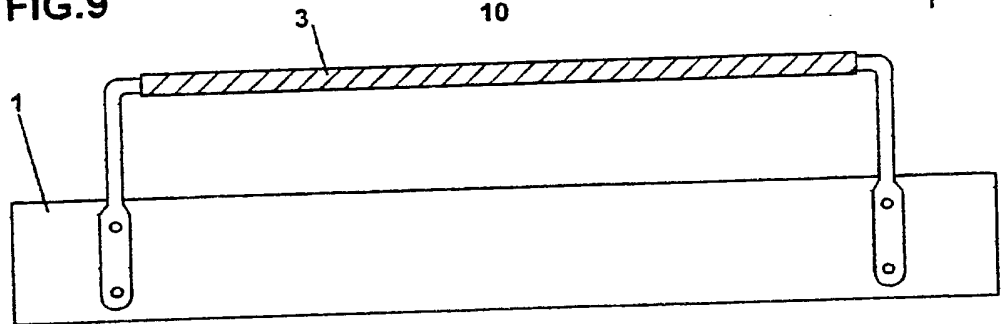


FIG. 10

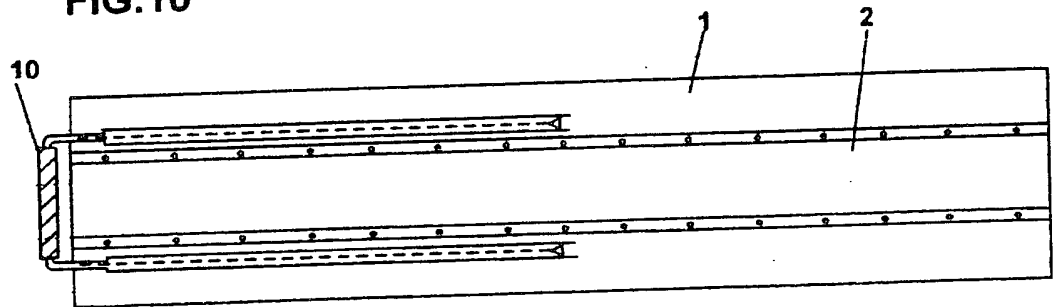


FIG. 11

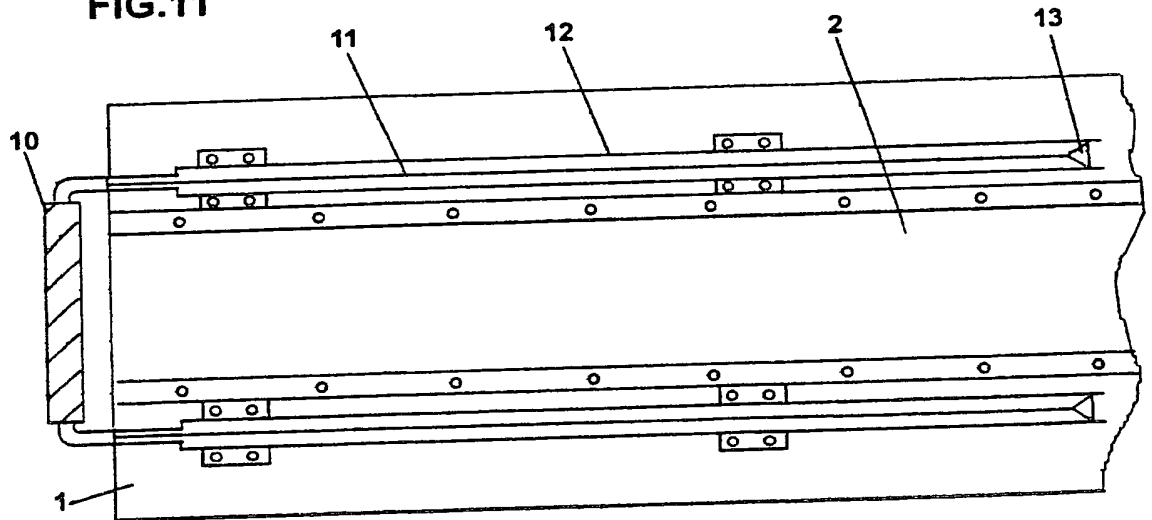


FIG. 12

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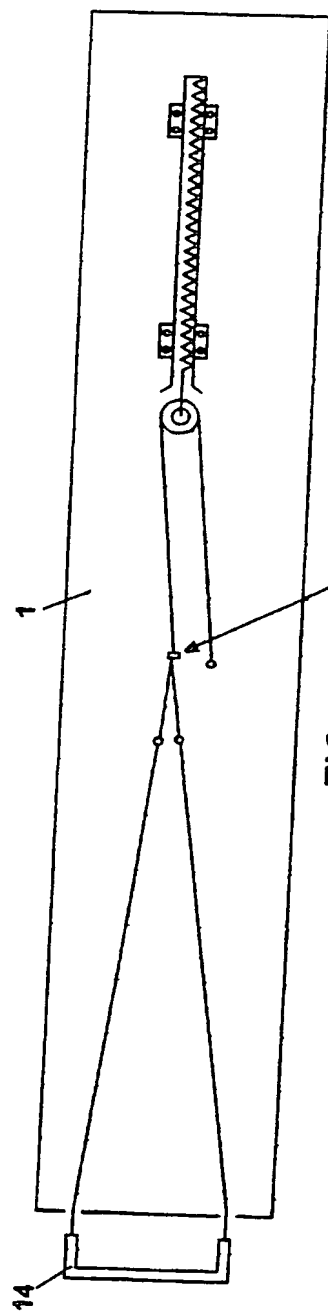


FIG. 13

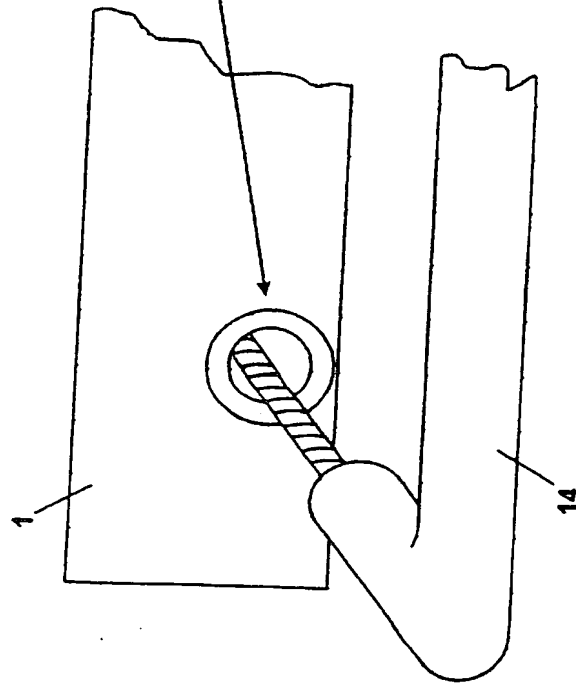


FIG. 19

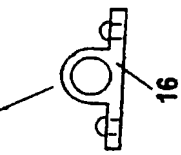


FIG. 15

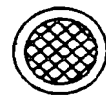


FIG. 17

FIG. 18

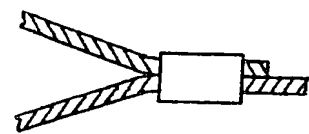


FIG. 16

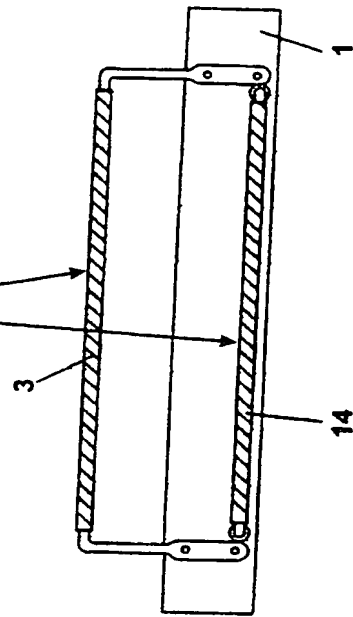
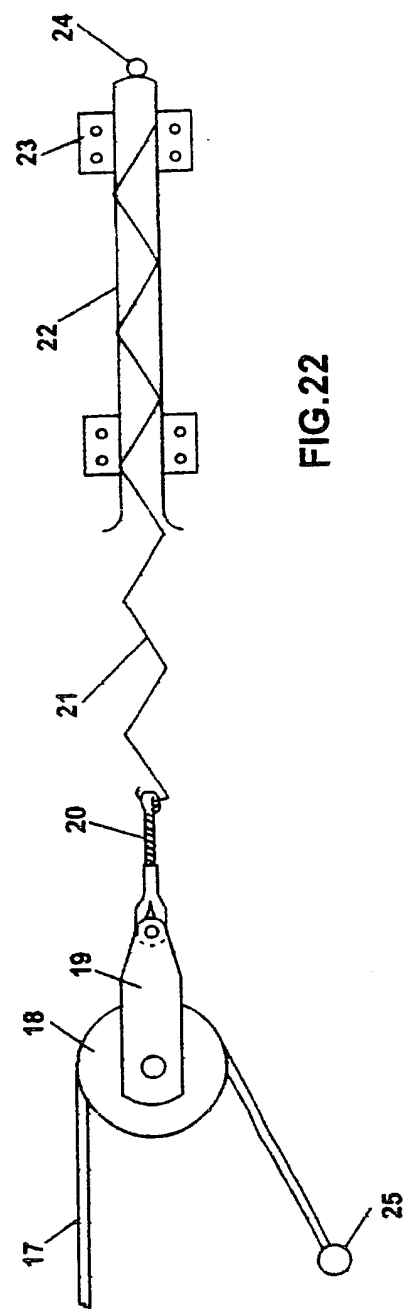
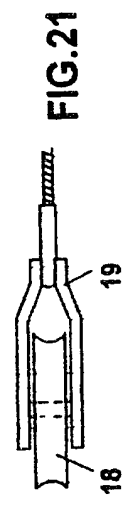
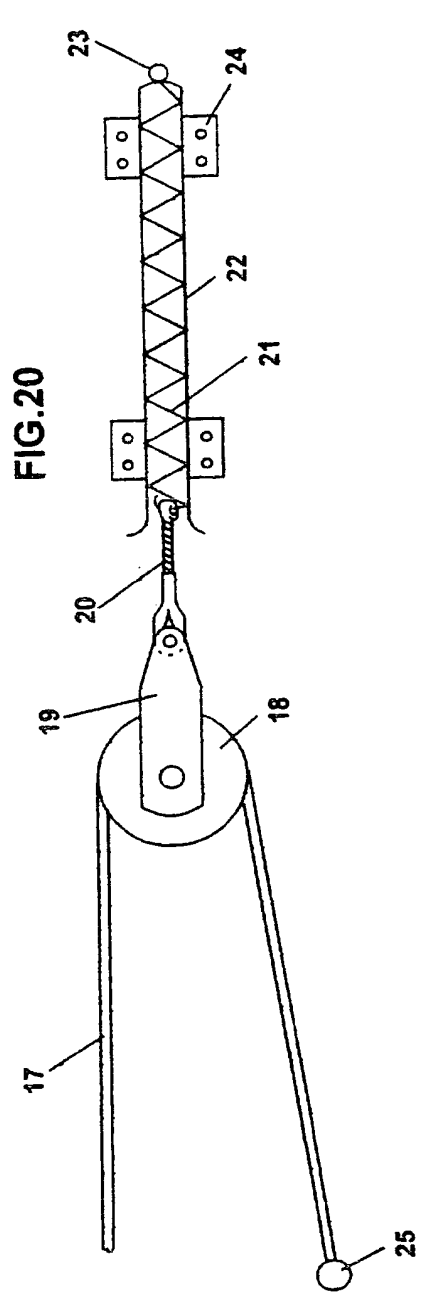


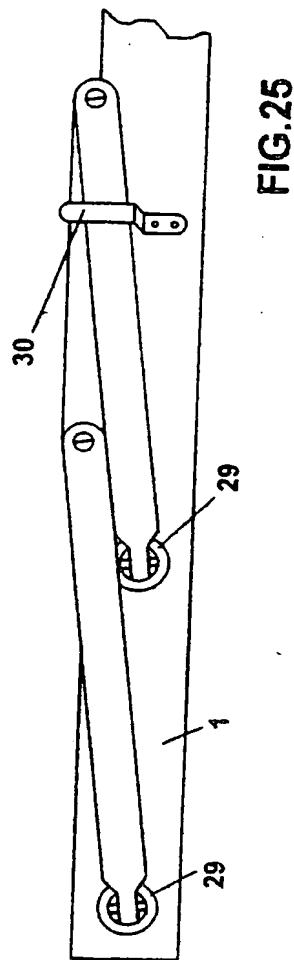
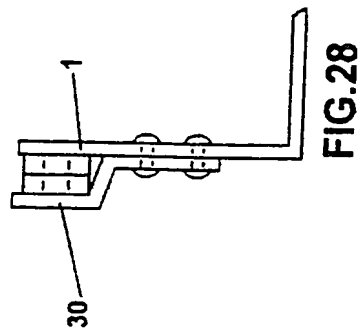
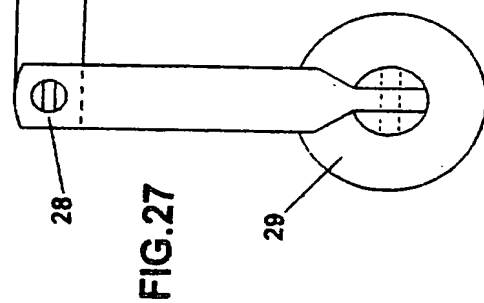
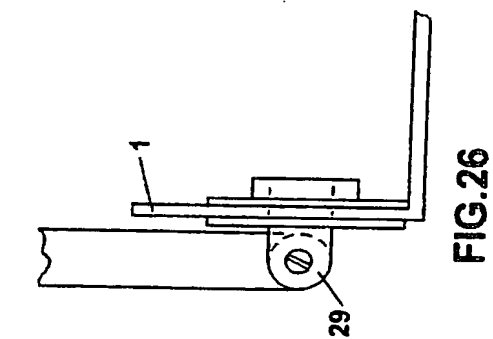
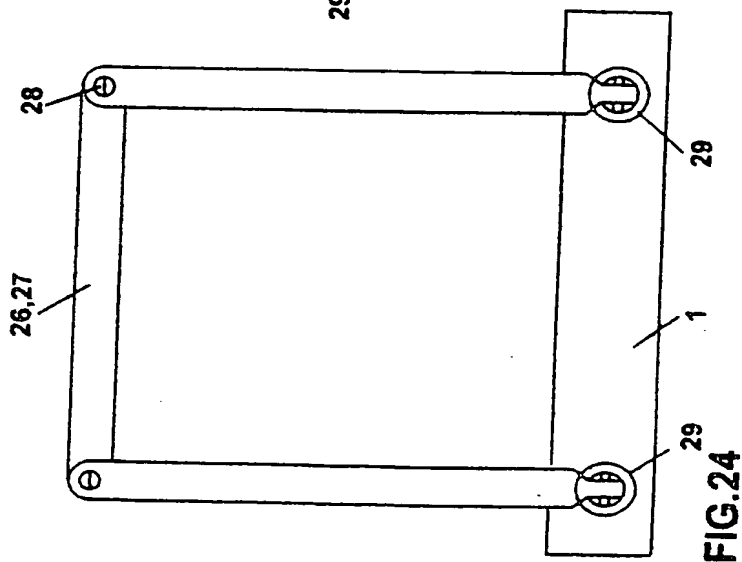
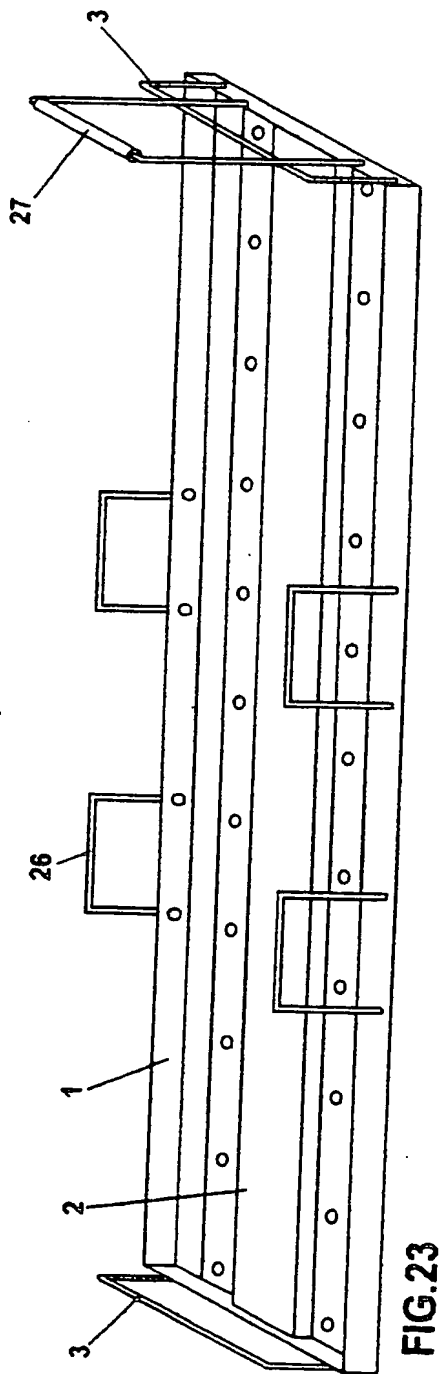
FIG. 14

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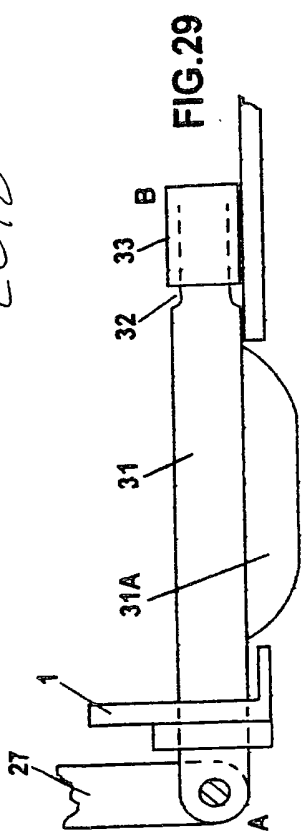


FIG. 29

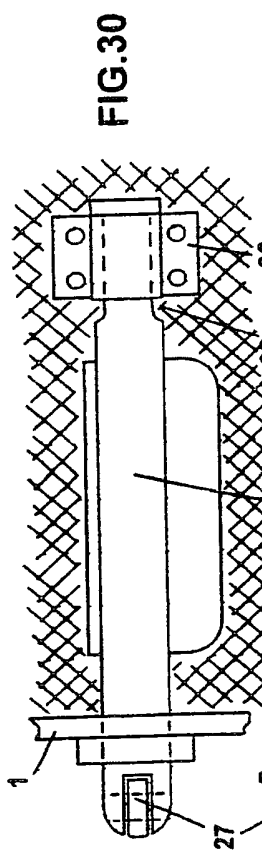


FIG. 30

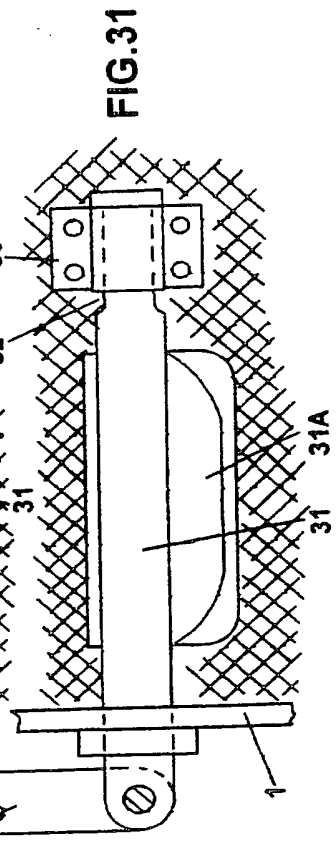


FIG. 31

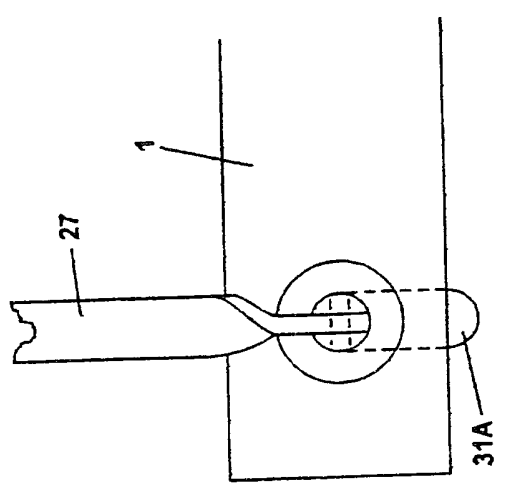


FIG. 32

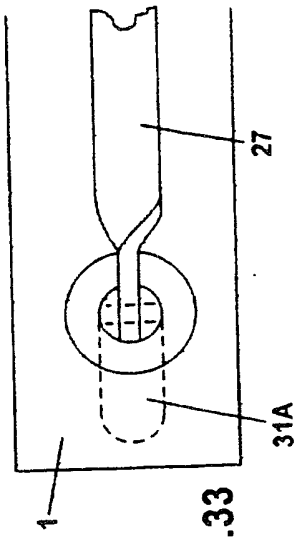
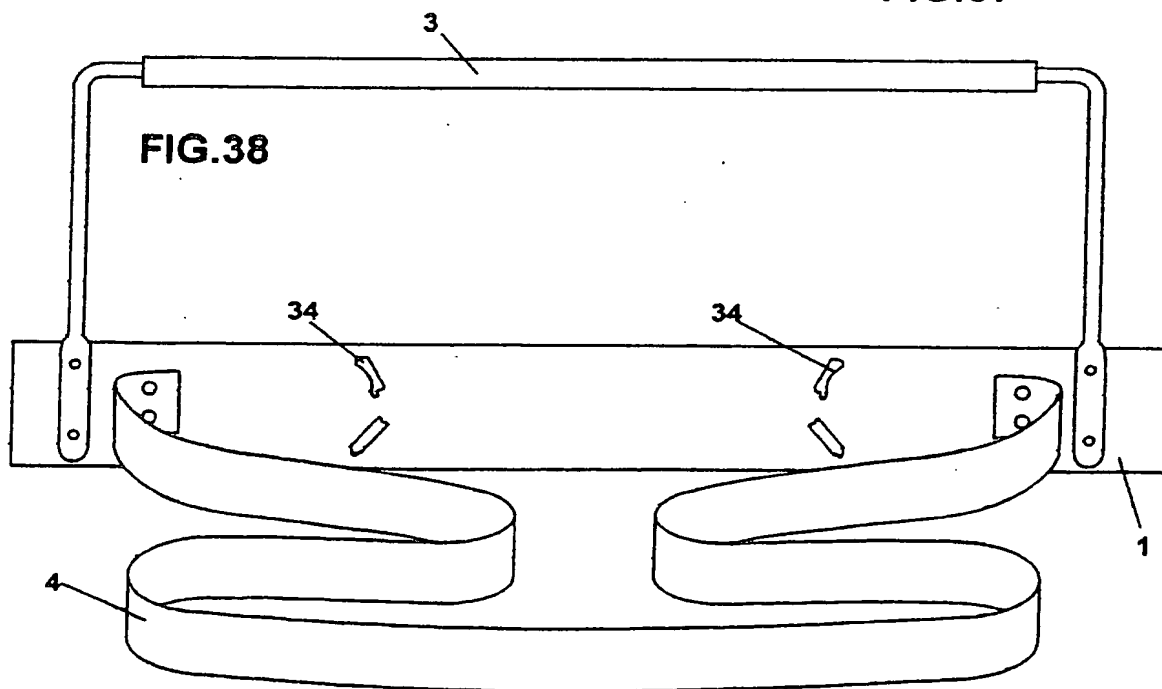
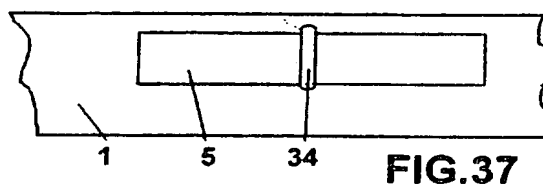
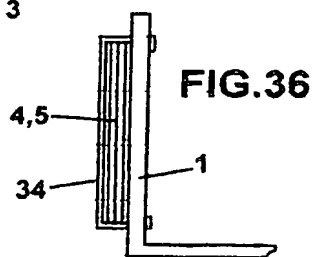
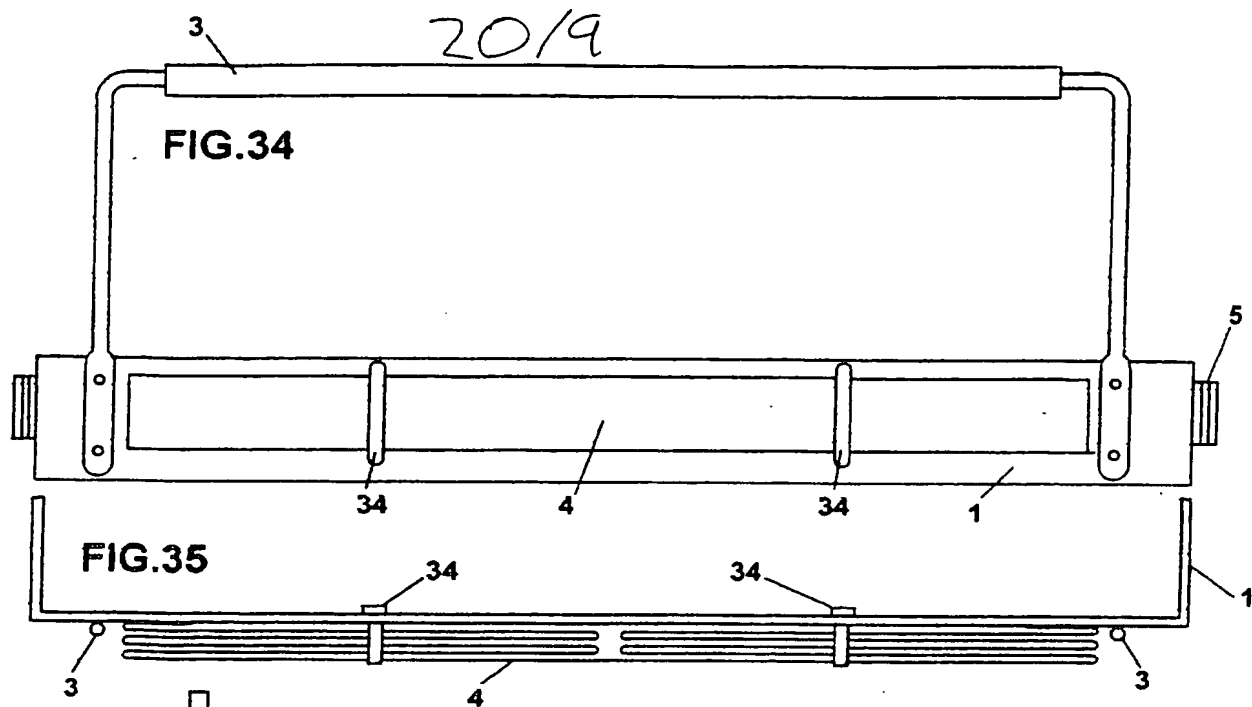
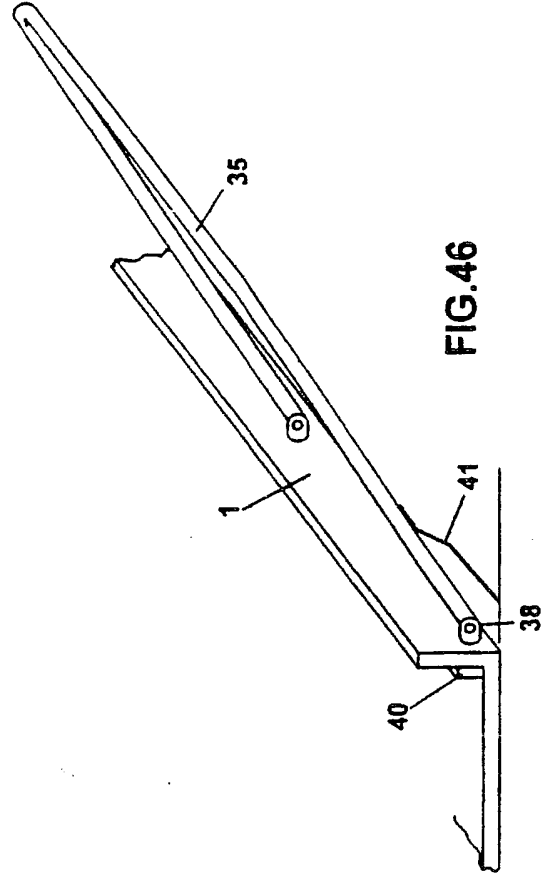
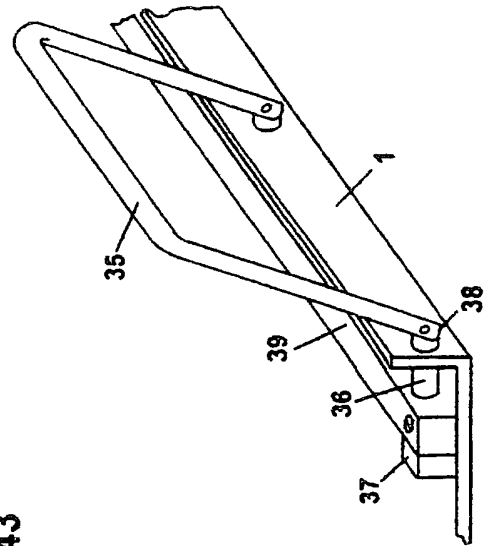
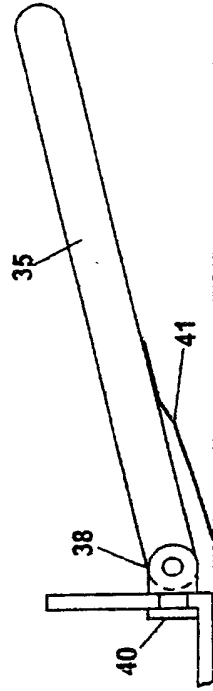
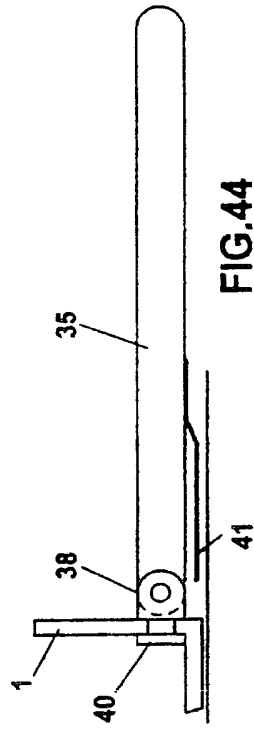
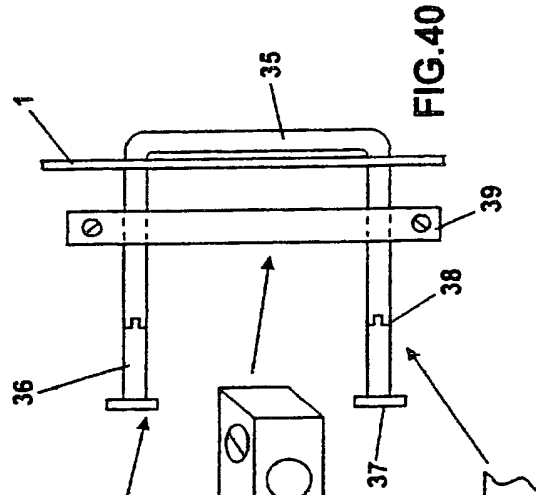
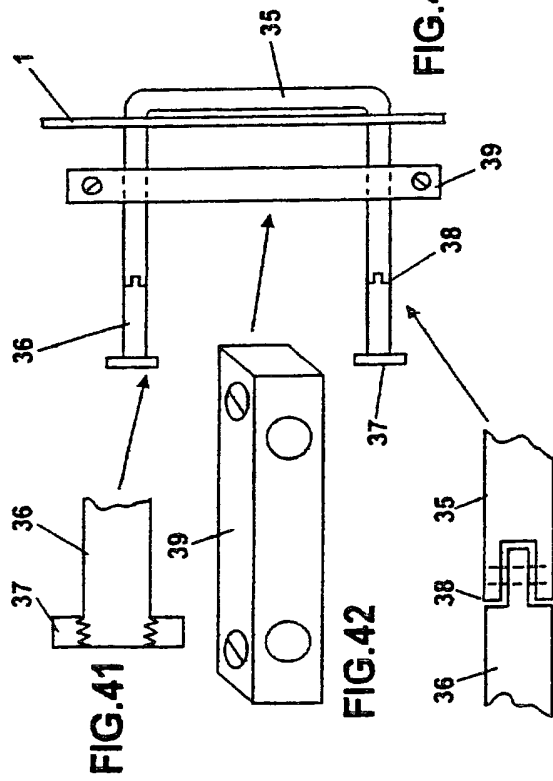


FIG. 33



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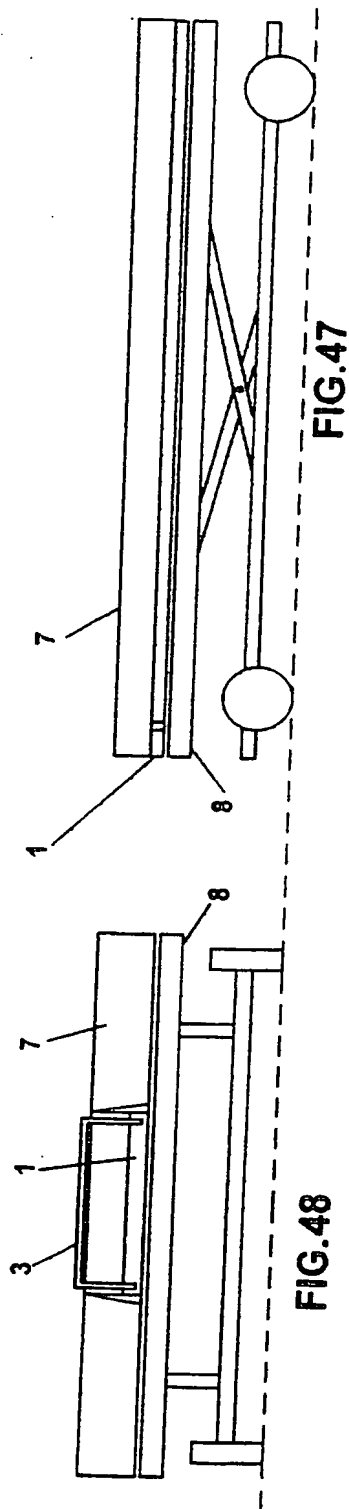


FIG.47

FIG.48

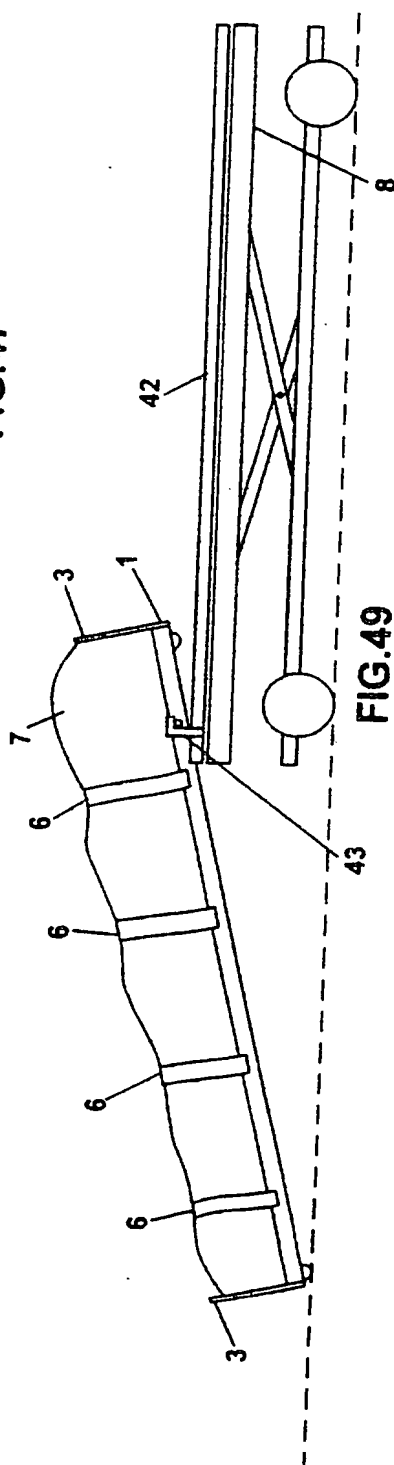


FIG.49

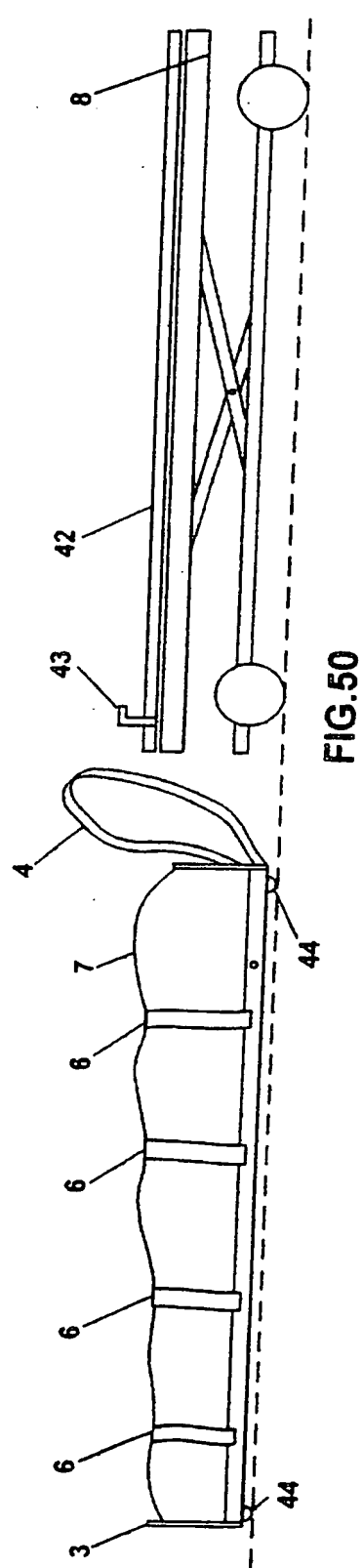
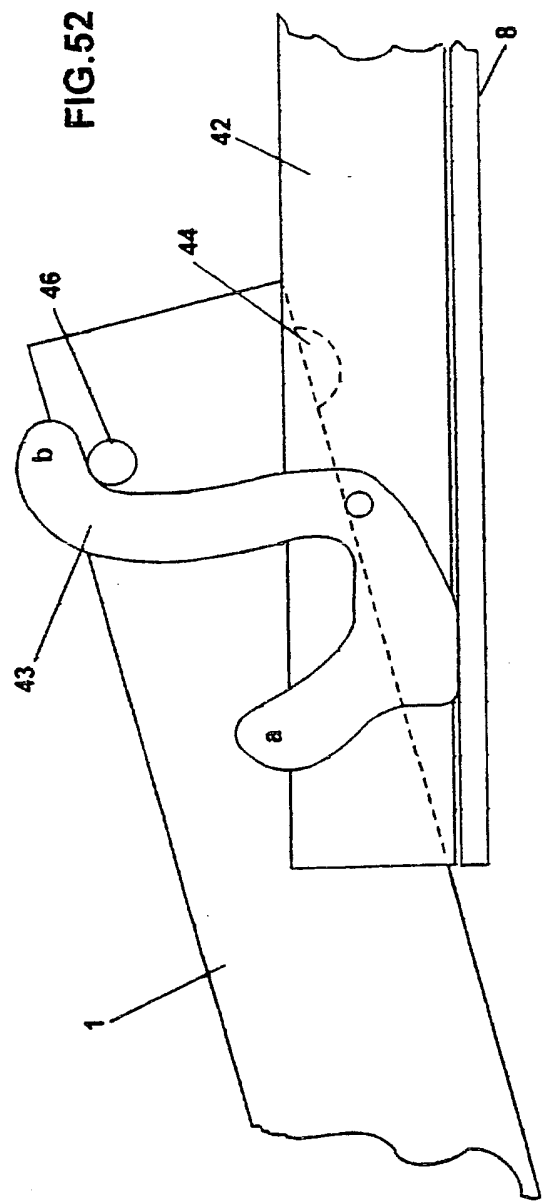
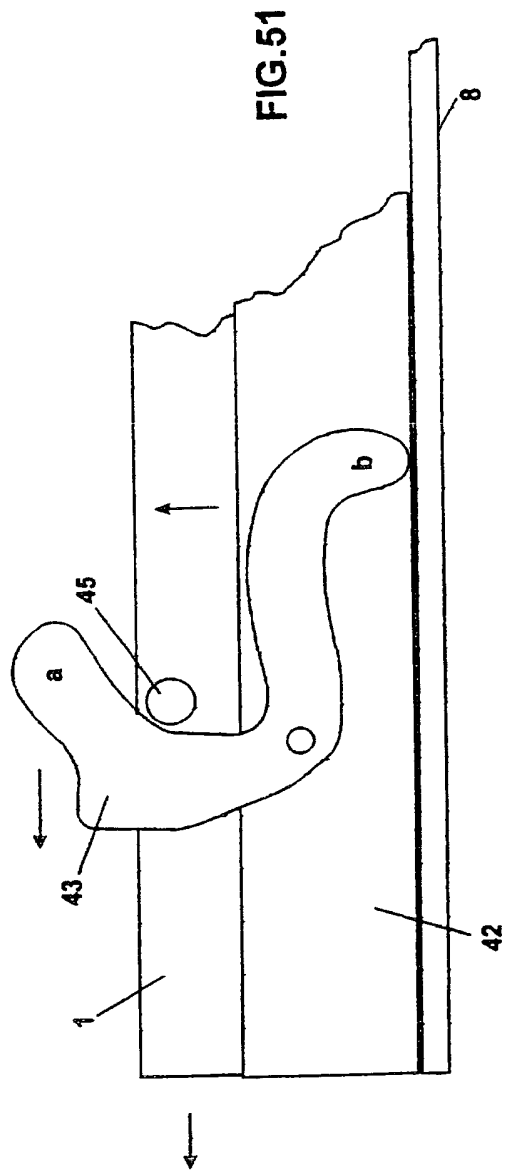


FIG.50

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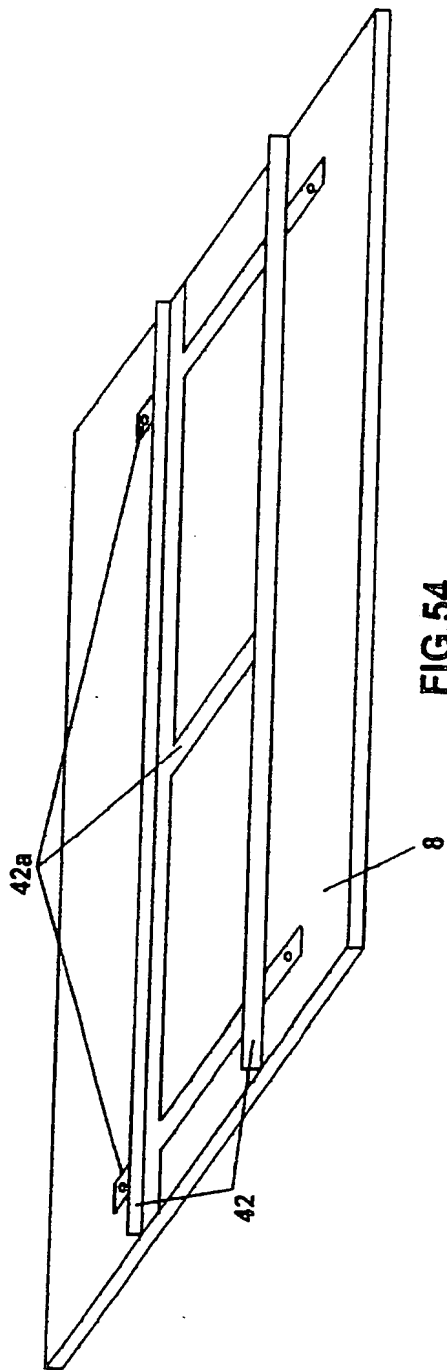


FIG. 54

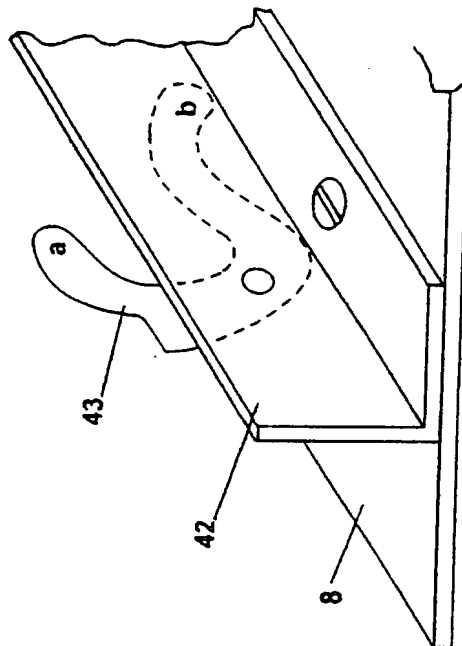


FIG. 53

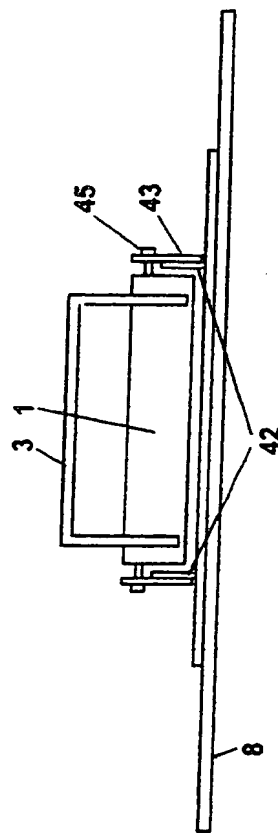


FIG. 55

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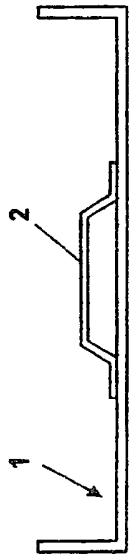


FIG. 56

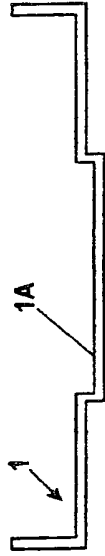


FIG. 57



FIG. 58

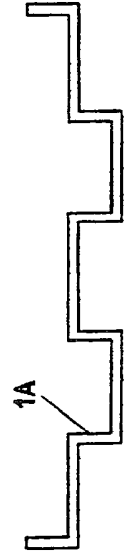


FIG. 59



FIG. 60

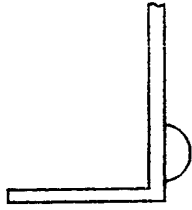


FIG. 56A

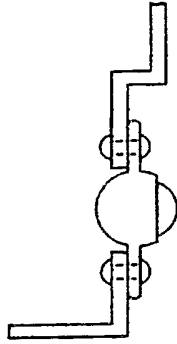


FIG. 57A

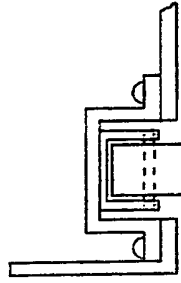


FIG. 58A

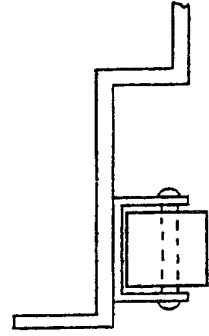


FIG. 59A

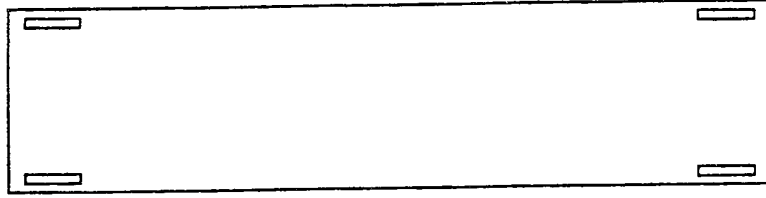


FIG. 61

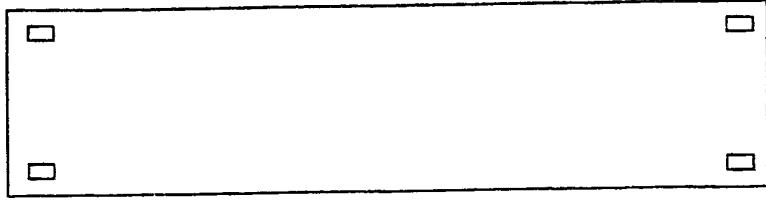
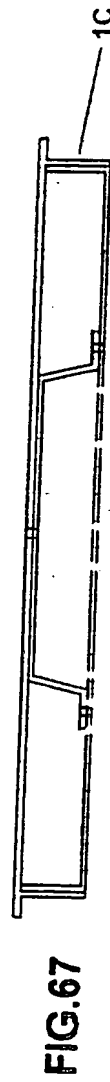
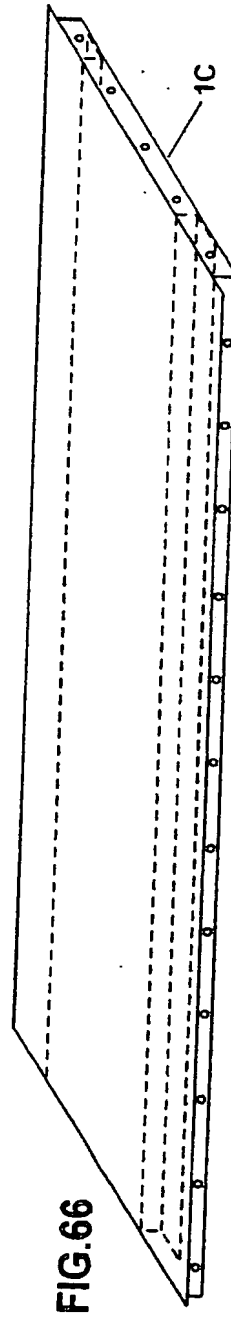
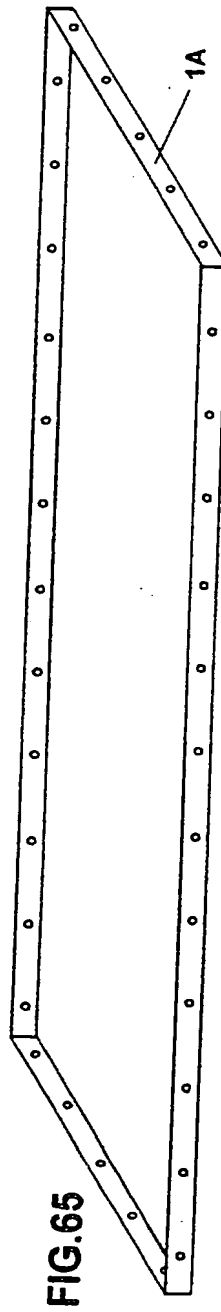
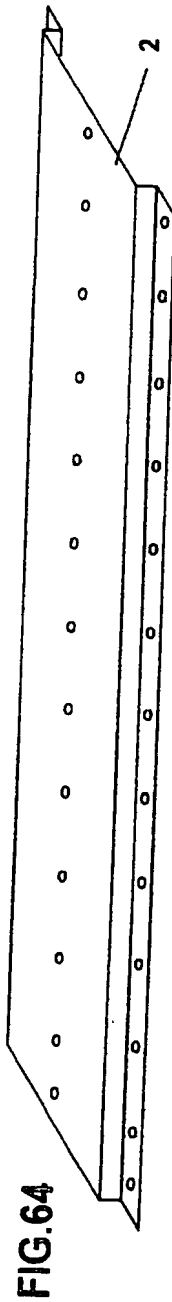
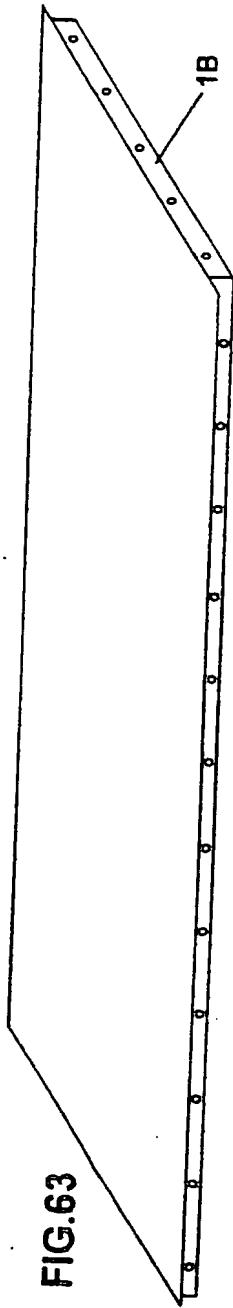


FIG. 62



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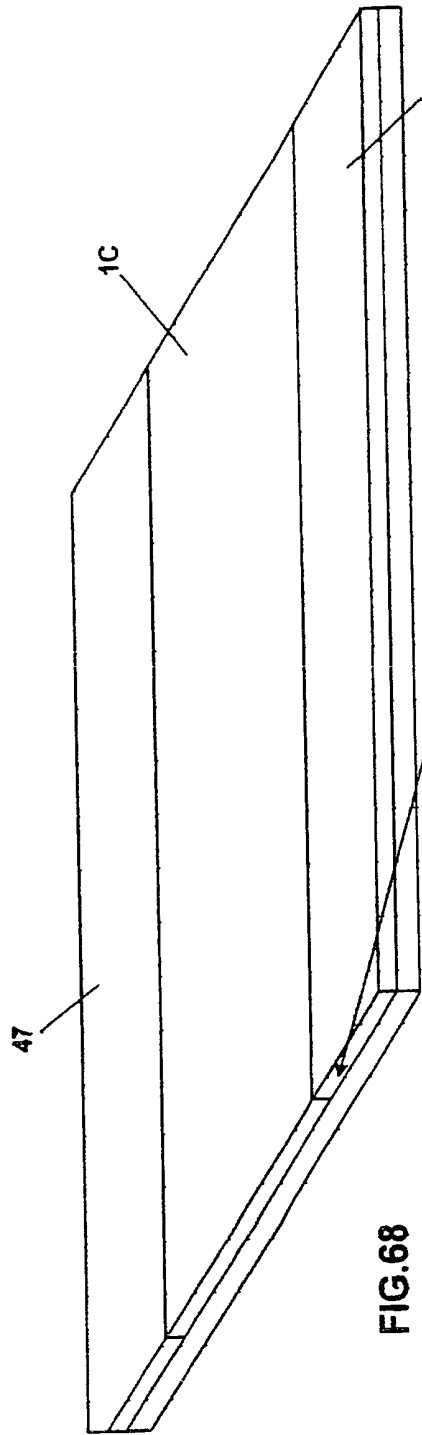


FIG. 68

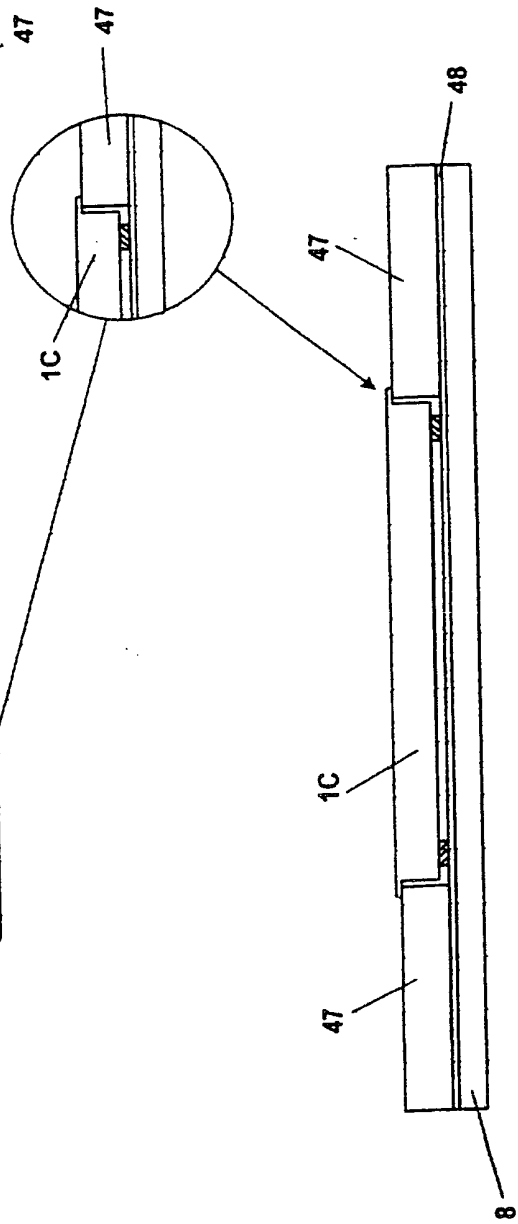


FIG. 69

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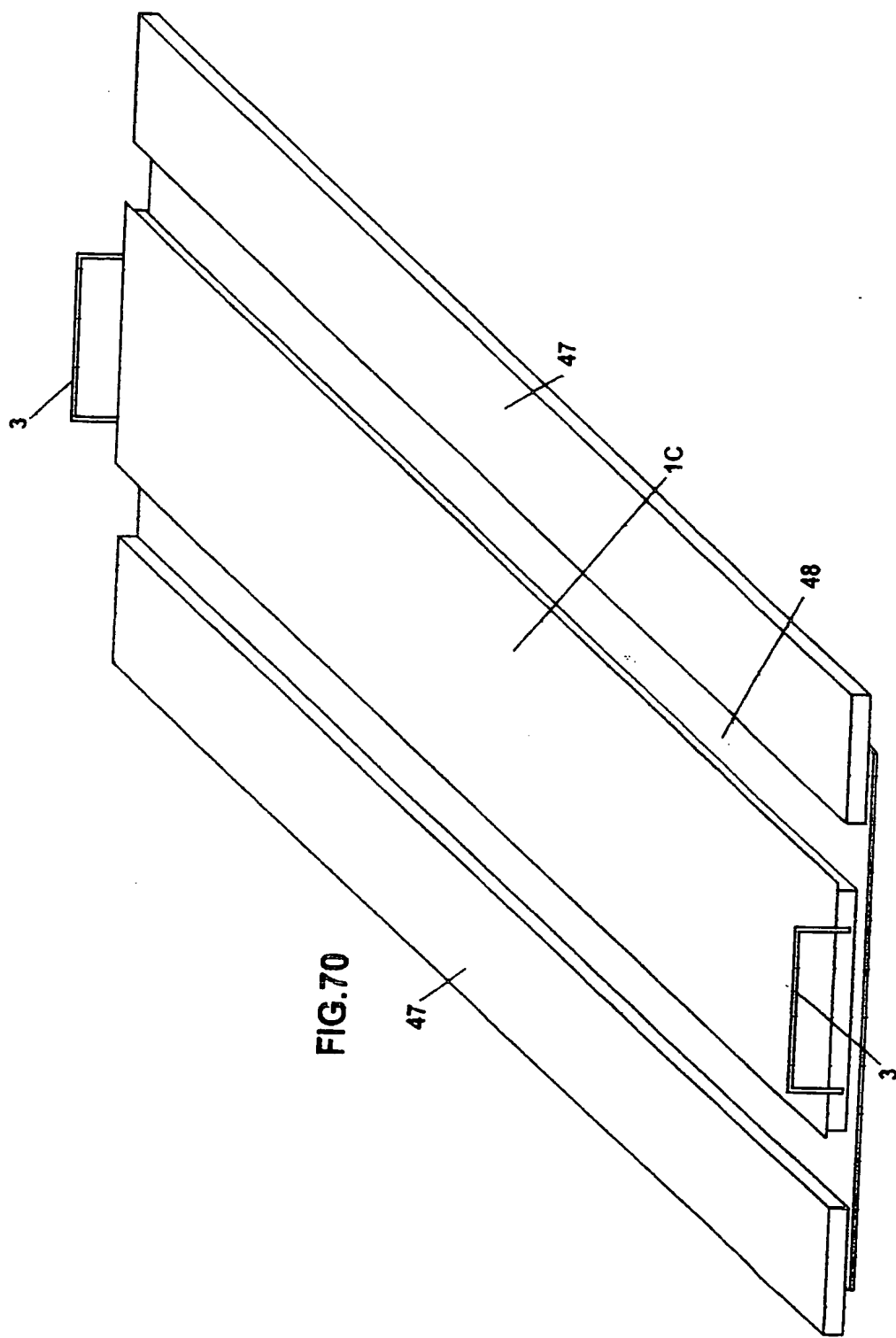


FIG. 70

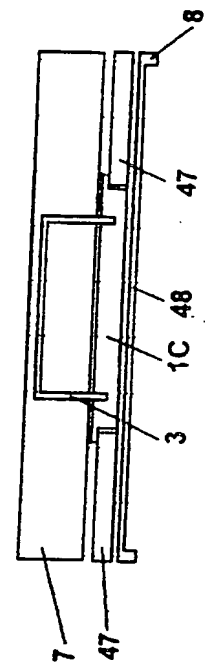


FIG. 71

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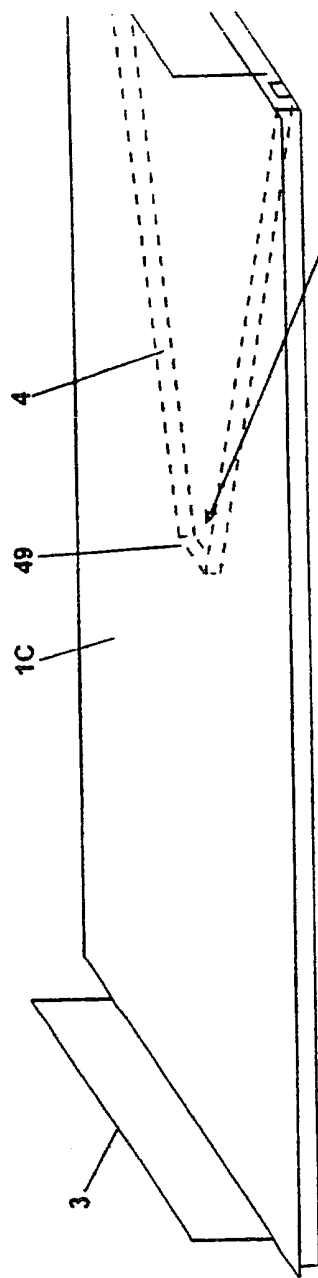


FIG. 72

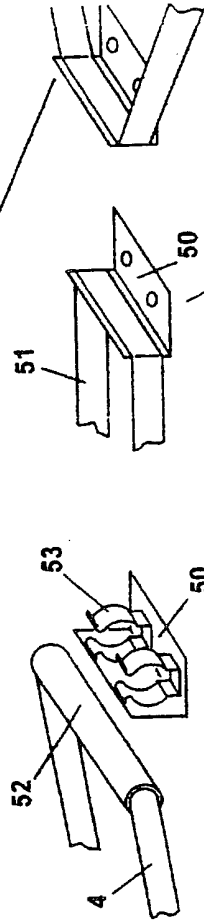


FIG. 73

FIG. 74

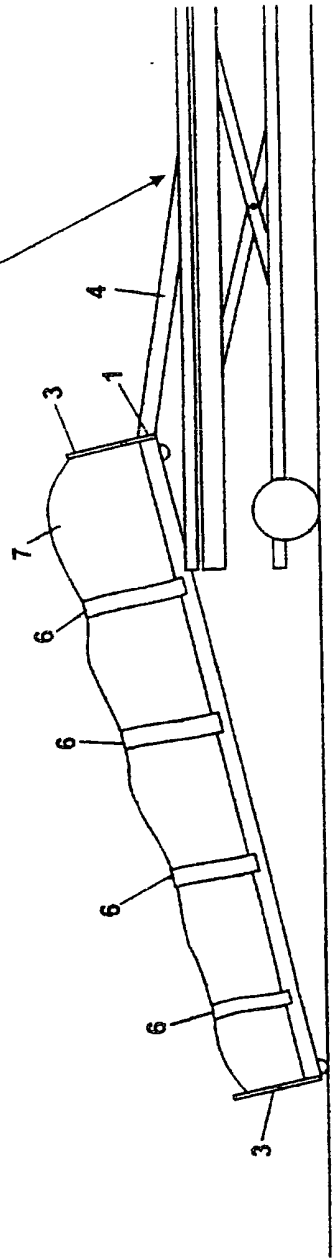


FIG. 75

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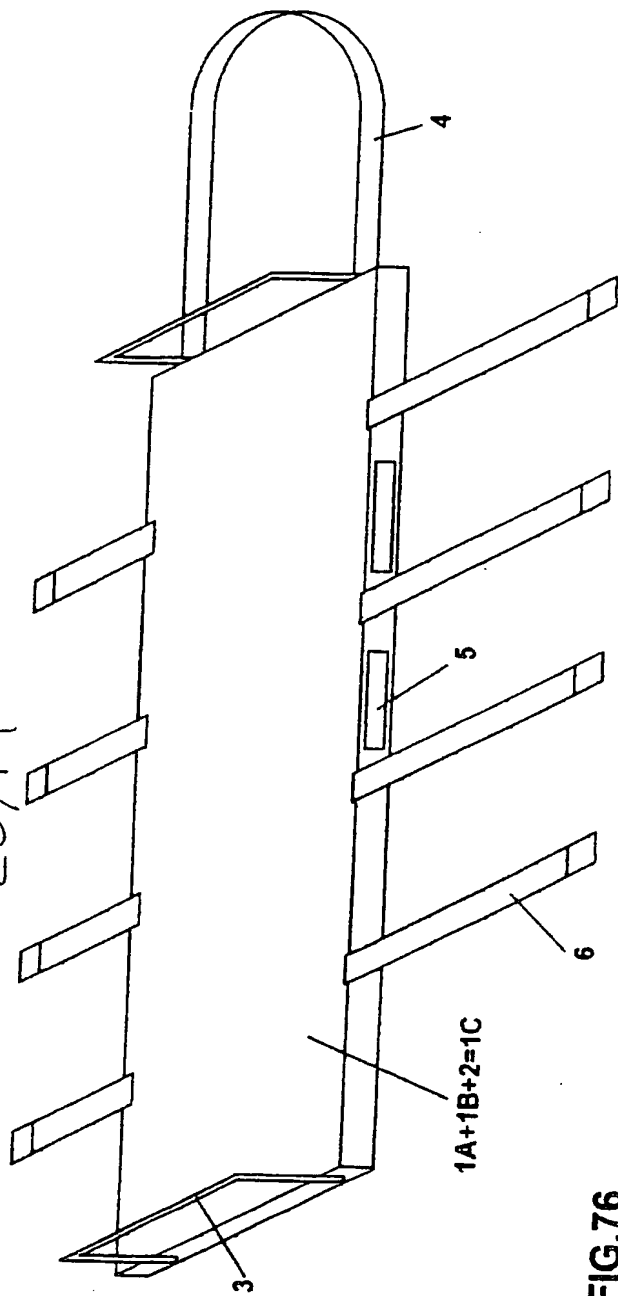
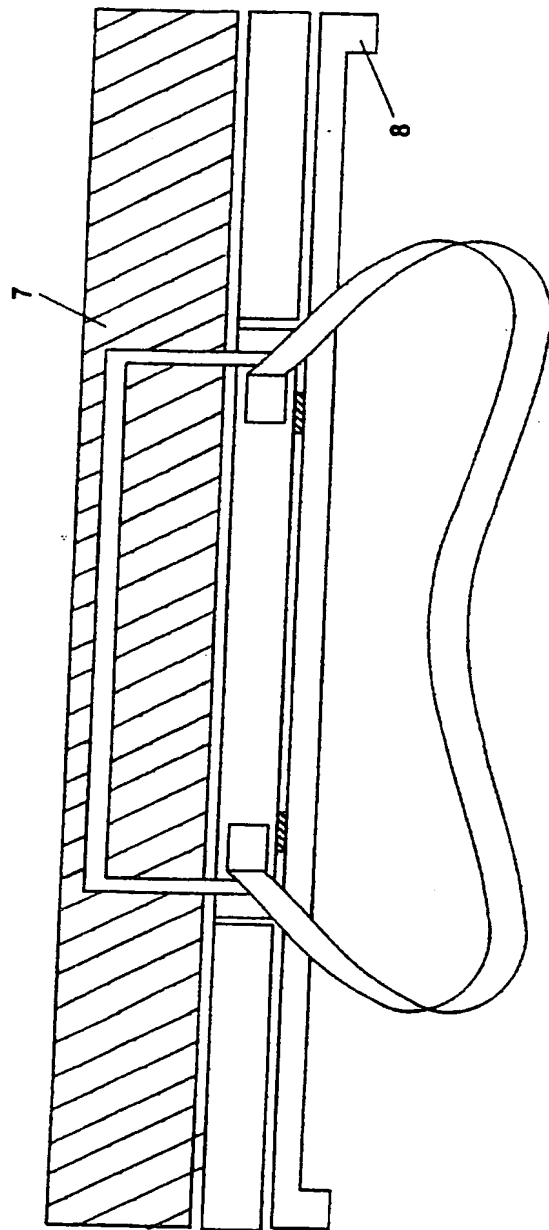


FIG. 76



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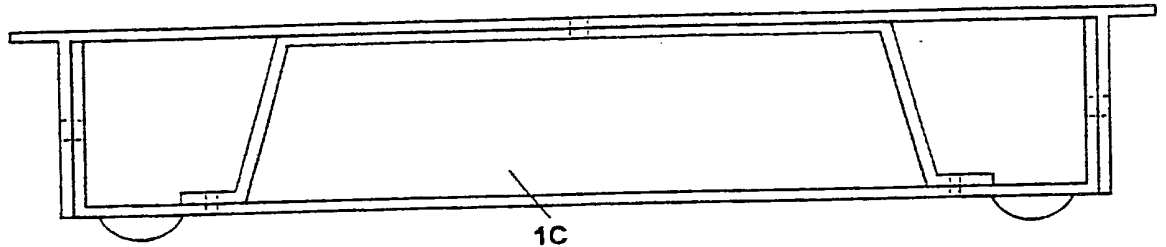


FIG. 77

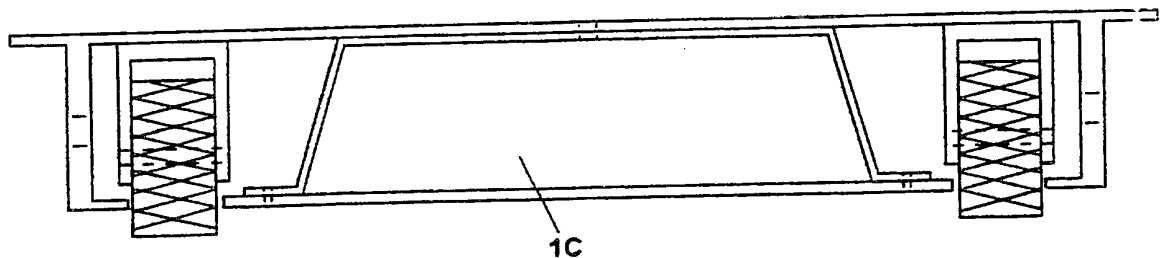


FIG. 78

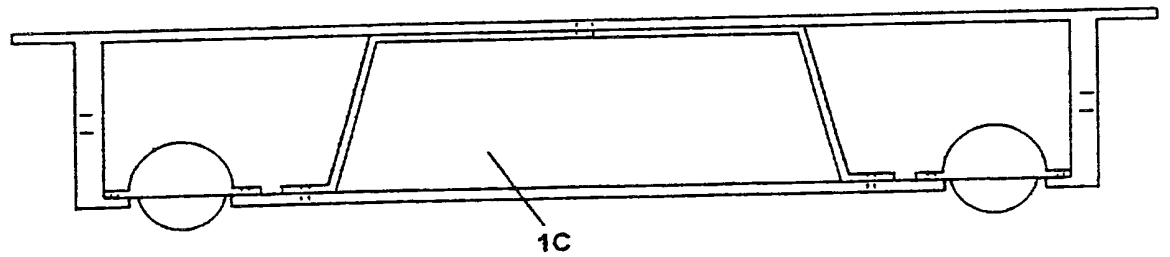


FIG. 79

TITLE

Emergency Evacuation Apparatus for Bedridden and Mobility-Impaired People

DESCRIPTION

The invention relates to an improved evacuation apparatus to enable the rapid and safe removal of bedridden people from hospitals, old persons homes and other buildings in emergency situations.

In the event of an emergency requiring the fastest possible evacuation, it is a major concern that the most vulnerable people present the greatest difficulty in being evacuated to safety. The old and infirm, and bed-ridden hospital patients, being persons with limited mobility, are dependent upon helpers in executing their safe evacuation. There are a number of prior proposals for harness arrangements and stretchers or "body bag devices" to assist this operation but all of them have restricting limitations for their use. The existing methods of transporting the bedridden generally require patients to be bodily lifted from the bed. This is time consuming, requires considerable strength and invariably requires more than one person to effect the lifting of the patient from the bed. It is also especially dangerous for patients who have injuries or post operative conditions. For many patients, especially those with spinal injuries, broken bones or have serious heart or lung conditions, it is essential to maintain the body in a rigid and flat position. The present available and proposed items of evacuation apparatus do not sufficiently maintain the patient in a rigid position to prevent injury or further damage to the patient, and do not address the problem of single-handed evacuation procedures when only one nurse may be available in an emergency situation to evacuate each bed-ridden patient.

The most frequently proposed patient evacuation apparatus is one which simply wraps the bed mattress around the patient in a form of cocoon, requiring the patient to be then lifted bodily to the floor and dragged from the building. GB-A-2030047, GB-A-1584102 and GB-A-1434832 disclose three alternative webbing structures which pass around patient and mattress to form such a cocoon. With such webbing structures it is intended that the sole protection for the patient during evacuation will be provided by the enveloping mattress.

WO-A-9203115 discloses an alternative patient restraint and evacuation apparatus. Instead of straps, two complete sheets of restraining fabric are passed over the patient and fastened together. One sheet, with a head aperture passes from the head end of the mattress and the other passes from the foot end. The mattress is not folded, but moved generally flat from the bed. To assist moving the flat mattress and restrained patient, an articulated sled is provided beneath the mattress and has wheels for ease of movement. The sled does not provide additional protection for the patient, but merely facilitates the dragging of an otherwise flat mattress out of a room or building.

WO-A-890939 is a prior proposal which combines both the mattress wrapping and patient cocooning feature of earlier proposals with any kind of semi-rigid structure beneath the mattress. WO-A-890939 proposes the use of a relatively rigid support member comprising a sheet of corrugated board beneath the mattress. The board has at least two transverse fold lines so that it lacks longitudinal rigidity from one end to the other but can fold or flex as three or more shorter relatively rigid panels, in substantially the same manner as the sled of WO-A-9203115.



### The Invention

The invention provides an emergency evacuational apparatus for removing a bed-ridden patient from a bed in an emergency situation, comprising a rigid base tray that is strong enough to support the weight of an adult patient while maintaining its rigidity, the tray having a width which is approximately that of an adult body and a length which is substantially equal to a mattress length; wheels, glide members, roller balls or castors on the base tray to facilitate its movement over the floor; and straps anchored to the base tray for wrapping around the mattress to draw the mattress around the patient to restrain and cocoon the patient in an emergency evacuation situation.

The straps are preferably provided with snap-fit couplings which permit them to be connected together to encircle the mattress and patient prior to tightening them to draw the mattress around the patient. Mechanical tensioning means may be provided.

- Some hospital mattresses are longitudinally divided into three parts which are hinged together along the top surface of the mattress to permit easy rolling and turning of a bed-ridden patient. Such mattresses are particularly useful in association with the apparatus of the invention, as the longitudinal divisions of the mattress facilitate its folding around the patient as a restraining cocoon.

Many hospital beds have inbuilt hydraulic raising and lowering devices, and a removable tail-board or frame. Such beds also tend to have solid bases onto which the mattresses are laid. In conjunction with such a bed the apparatus according to the invention makes patient evacuation very easy. To evacuate a patient in an emergency situation, first of all the mattress (whether a one-part or a three-part mattress) is wrapped around the patient to form a shielding cocoon of mattress material. After tightening the straps around the mattress and

patient to cocoon and restrain the patient, the bed is lowered to its minimum height, which may be less than 0.5 metres above floor level, the tail-board or -frame removed, and the rigid base tray pulled down the bed to an intermediate position in which it tips with its foot end resting on the floor and its head end resting on the foot end of the bed. This initial sliding motion is, however, made considerably easier and more precise if side portions of the mattress supporting surface of the bed act as guides, guiding the rigid base tray to move smoothly down the centre of the bed without deviation from side to side.

Preferably some restraining mechanism is provided to latch the apparatus in the intermediate position. A single nurse can man-handle the apparatus to the intermediate position without difficulty and without strain, because the wheels, glide members, roller balls or castors have facilitated the longitudinal sliding and the nurse has to support only half the patient's weight while lowering the foot end of the base tray to the floor. The nurse or other person manhandling the patient out of the hospital bed in an emergency situation will stand initially at the foot end of the bed to pull the base tray down the bed until the above intermediate position is reached. The nurse then moves to the head end of the base tray, releases the restraining mechanism and lowers the head end to the floor. The patient can then be dragged out of the building as necessary. Being at a low level, the patient has some natural protection against smoke inhalation in the case of a fire, and being cocooned in a foam mattress the patient is also well protected thermally.

The restraining mechanism is preferably the flexible web of the pulling handle which normally is stowed beneath the rigid base tray as it lies on the top surface of the bed. When the intermediate position of patient removal is reached, that pulling handle web becomes taut around an upstanding detent on the top surface of the bed, that

detent normally being received in a hollow beneath the rigid base tray. The nurse would then move from the foot end of the rigid base tray to the head end, and preferably the pulling handle is provided with a quick release mechanism enabling it to be detached from the upstanding detent, so that the head end of the rigid base tray can then be released, lowered to the floor, and the patient dragged from the building.

The rigidity of the base tray is of fundamental importance to the invention. In the intermediate position of the base tray during its removal from the bed, for example, longitudinal rigidity of that portion of the mattress on which the patient is lying is maintained. The same rigidity is maintained when man-handling the apparatus down stairs or out through a window, either of which could be situations encountered during an emergency evacuation. It is important to appreciate that even if the patient had had a spinal injury or had been immobilized for any other reason, the above described evacuation procedure would have been feasible, even to the point of moving the apparatus down stairs or through a window, because the base tray provides all the rigidity necessary to keep the patient in an immobilized condition during evacuation.

Preferably the rigid base tray has a width less than that of the bed from which the patient is to be evacuated, and is longitudinally slidable in a channel created in the upper mattress-supporting surface of the bed, so that the upper surface of the bed is substantially flat and planar when the base tray is in position.

Such a rigid base tray preferably comprises an assembly of pieces of sheet material folded to establish the necessary rigidity. Individual pieces of folded sheet metal may be connected to each other by spot welds or by rivets. Preferably a rigid base tray formed in this way would be supplemented by a fiat top plate, which could be secured

to the remainder of the rigid base tray through downwardly extending side or end flanges. Secured fast to the hospital bed, one along each side of the rigid base tray, are preferably folded box sections of sheet metal to raise the opposite side edges of the hospital bed to substantially the same height as the top of the base tray, so that the complete mattress supporting surface of the hospital bed becomes substantially planar when the rigid base tray is in position.

In a preferred embodiment of the invention, a pulling handle for dragging the patient out of the building on the rigid base tray during evacuation in an emergency situation is normally stowed beneath the rigid base tray and connected to the hospital bed by a rapid release fastening, so that as the rigid base tray is pulled down the bed until it tips with its foot end resting on the floor and its head end resting on the foot end of the bed, the pulling handle becomes taut and provides the restraining mechanism for arresting the apparatus in its intermediate position.

Modifications of the apparatus of the invention enable it to be used as an efficient patient transporter within hospitals on a routine basis in addition to its intended function as emergency evacuation apparatus.

#### DRAWINGS

Various optional or preferred aspects of the invention are apparent from the following description with reference to the drawings of which:

Figure 1 is an end view of apparatus according to the invention with a patient cocooned in a mattress during evacuation;

Figure 2 is a perspective view of Figure 1;

Figure 3 is a perspective view of the base tray only of Figure 1;

Figure 4 is a perspective view of an unreinforced shell of the base tray of Figure 3;

Figure 5 is a perspective view of a longitudinal reinforcement for the shell of Figure 4;

Figure 6 is a perspective view of the apparatus of Figure 1 without mattress or patient;

Figures 7 and 7A are two enlarged details of alternative strap anchorages for use in Figure 6;

Figure 8 is a head end view of the apparatus of Figure 1, with a mattress, laid out on a hospital bed, but omitting the straps;

Figure 9 is a head end view, corresponding to Figure 8 but without the mattress, of a second embodiment of apparatus according to the invention;

Figure 10 is foot end view of the apparatus of Figure 9;

Figure 11 is a plan view from above of the apparatus of Figure 9;

Figure 12 is an enlarged detail from the head end of the apparatus of Figure 11;

Figure 13 is a schematic and illustrative plan view from above, similar to the plan view of Figure 11, of a third embodiment of the invention;

Figure 14 is a head end view of the apparatus of Figure 13;

Figures 15 to 22 are enlarged details of different parts of the pulling handle extension and retraction mechanism of the apparatus of Figure 13;

Figure 23 is a perspective view of a fourth embodiment of the invention, omitting the straps;

Figures 24 and 25 are enlarged details of the side and end handles of Figure 23 in their extended and retracted conditions respectively;

Figures 26 to 28 are enlarged details of the handles of Figures 24 and 25;

Figures 29 to 33 are enlarged details of modified handle structures of Figures 24 to 28, the modification being that raising the handles to their extended conditions causes the extension also of skids under the base tray;

Figure 34 is a head end view of a fifth embodiment of the invention;  
Figure 35 is a plan view from above of the extreme head end only of the apparatus of Figure 34;  
Figure 36 is a vertical section through a side wall of the base tray and through a folded and stowed strap of the apparatus of Figure 34;  
Figure 37 is a side elevation of the folded and stowed strap of Figure 36;  
Figure 38 is a head end view corresponding to Figure 34 after the pulling handle has been unpacked for use;  
Figure 39 is a detail of another modified handle structure of Figures 24 to 28, this modification that the handles must be extended laterally before being raised;  
Figure 40 is a plan view from above of the handle structure of Figure 39 when stowed;  
Figures 41 to 43 are enlarged details of the handle of Figures 39 and 40;  
Figures 44 to 46 are details of a further modified handle structure suitable for the side handles only;  
Figures 47 and 48 are side and end elevations respectively of a hydraulically actuable hospital bed on which is positioned an apparatus according to the invention;  
Figure 49 is a side elevation of the bed and apparatus of Figure 47, with the patient cocooned in the bed mattress and in an intermediate position of removal from the bed;  
Figure 50 is a side elevation corresponding to Figure 49 but with the patient completely removed from the bed;  
Figure 51 is a detail of one possible latch mechanism for retaining the apparatus and patient in the intermediate position of Figure 49, the latch being retracted;  
Figure 52 is a detail corresponding to Figure 51, but with the latch extended;  
Figures 53 to 55 illustrate the location of the latch mechanism of Figures 51 and 52 on a rail framework provided on a hospital bed;  
Figures 56 to 60 illustrate alternative configurations of the base unit which might be adopted to ensure the

necessary rigidity of that base unit in accordance with the invention;

Figures 56A to 59A illustrate alternative ways in which slides, rollers balls or wheels could be accommodated in the respective alternative configurations;

Figures 61 and 62 illustrate the preferred locations of those slides, roller balls or wheels relative to the plan view of the base unit;

Figures 63 to 65 are perspective views of three components of a rigid base tray according to a preferred modification of the invention;

Figure 66 is a perspective view of the assembled base tray;

Figure 67 is an end view of the assembled base tray, viewed from the head end;

Figure 68 is a perspective view of the top surface of a hospital bed with the rigid base tray in position;

Figure 69 is an end view of the bed top surface of Figure 68, shown schematically;

Figure 70 is a further perspective view of the bed top and base tray of Figure 8, but shown "exploded" and also showing lifting handles provided on the base tray;

Figure 71 is an end view corresponding to that of Figure 69, but showing the mattress and lifting handles in position;

Figure 72 is a schematic perspective view of the base tray of Figures 63 to 71 showing a pulling handle stowed beneath the base tray;

Figure 73 is the detail of one possible quick release mechanism for the pulling handle of Figure 72;

Figure 74 is a schematic illustration of another possible quick release mechanism for the pulling handle of Figure 72;

Figure 75 is a side elevation of a hospital bed during patient evacuation, with the rigid base tray of Figures 72 to 74 arrested in its intermediate position by the tautening of the pulling handle;

Figure 76A is a perspective view of the rigid base tray only of Figures 63 to 75, but with the carrying handle, lifting straps, body-securing strap units and pulling handle all installed;

Figure 76B is an end view corresponding to Figure 71 but showing also a pulling handle in its non-stowed condition; and

Figures 77 to 79 are end views of three alternative base trays according to Figure 67, but showing gliders, wheels and roller balls respectively which facilitate the movement of the base tray over the floor during patient evacuation.

Figures 1 to 8 are of a first embodiment of an apparatus of the invention; Figures 1 and 2 show a mattress (7) being drawn around a patient. It should be understood that hospital mattresses come in two types: either as one-piece mattresses or as mattresses longitudinally divided into three parts which are hinged together along the top surface of the mattress to permit easy rolling and turning of a bed-ridden patient. The invention described is applicable to both types of mattress, although the mattress illustrated in Figures 1 and 2 is a three-part sectional mattress. The base unit (1) (see Figure 8) is permanently on a bed base (8) with the three section mattress (7) laid on the bed base (8) with the centre section fitted into the base unit (1). In an emergency, the two outer sections of the mattress (7) are pulled up over the patient. Four strap units (6) are put around the mattress (7) and tightened, pulling the mattress (7) around the patient, preventing the patient from moving. A head restraint (not shown) may be placed between the mattress (7) and the patient's head to prevent the patient's head from moving. The rescue unit can then be removed from the bed and taken to safety. Having the mattress (7) around the patient prevents the patient from being bumped or knocked, and protects the patient from the heat of a fire. The base unit (1) maintains patient



stability, assists removal of the patient from the bed base (8) even by one person, and assists patient removal from a danger zone even when the escape route is down stairs.

Figures 3 to 5 show the base tray make up. The base tray (1A) is an elongated structure with raised sides. A top hat reinforcement section (2) is a sheet of material either folded or moulded to form the required shape. The two outer edges are drilled along their full length. The top hat section (2) is placed centrally into the base tray (1A). Holes are drilled in the base tray (1A) matching the holes in the top hat section (2) holes. The top hat section (2) and base tray (1A) are riveted together as shown in Figure 3. Alternatively the sections could be spot welded together, if metal. The top hat section (2) makes the base tray (1A) rigid. The base tray (1A) and the top hat section (2) can be manufactured from many types of materials, i.e. ferrous or non-ferrous metals, plastics or glass fibre.

Figures 6 to 8 show a basic unit set up. Attached to the base unit (1) are two lifting handles (3), one at the head and the other at the foot end. The lifting handles (3) are constructed of round stainless steel bar, flattened at the ends and riveted to the raised edges of the base unit (1). A pulling handle (4) made of webbing is riveted to the raised edge of the base unit (1) at the head end. Four side lifting straps (5) made of webbing are provided, two either side of the base unit (1) at the lifting points and secured with rivets (not illustrated) or welded loops (9) (Figure 7) or other attachment devices such as (9a) (Figure 7A) formed by slotting the base of the base unit (1) next to the raised edge, passing the end of the webbing through the slot and back up the other side of the raised edge, and attaching the end of the webbing onto the main part of the webbing on the other side of the raised edge, using a three-bar slide buckle. Four body-securing

strap units (6) fitted with side release clips and three-bar slide buckles are similarly anchored to each side of the base unit (1). The body-securing strap units (6) are made of webbing and are positioned to secure the chest, waist, thighs and lower legs. The middle section of the mattress (7) sits in the base unit (1) and the two outer sections rest on the bed base (8).

In a second embodiment of the invention (Figures 9 to 12) the webbing pulling handle (4) of Figures 6 and 8 is replaced by a rigid extensible handle (10) constructed of a round hollow bar which is bent at 90° at each end, a steel rope (11) passing through the handle (10). The rope (11) extends out of each end of the handle (10) approximately 1 metre. A hollow steel tube (12) is provided down each side of the inside of the base unit (1). The tubes (12) are narrowed at the head end of the base unit (1). Two holes are drilled in the vertical wall of the head end of the base unit (1) in line with the steel tubes (12). The 1 metre long ropes (11) on the handle (10) are fed into the tubes (12). The rope (11) ends have stops (13) fitted. In normal conditions, the handle (10) pushes through the base unit (1) end into the tubes (12). When required for use the handle (10) is pulled, the steel ropes (11) are drawn up the tubes (12) coming to a halt when the stops (13) reach the narrowed parts of the tubes (12). In this condition the base unit (1) can be pulled along the floor. To replace the ropes (11) back in the tubes (12) after use, they are simply fed back into the tubes (12).

Figures 13 to 22 illustrate a third embodiment which has an auto retractable pulling handle system. the pulling handle (14) is constructed of a round steel bar bent at each end at 90°. Two holes are drilled into the raised edge of the base unit (1), and in these holes rubber grommets (15) are fitted. A spring tube (22) is fitted at the foot end of the base unit (1) secured by the tube

fixings (24). A spring (21) is fitted into the spring tube (22) and secured at the bottom of the tube (22) by a spring securing bolt (23). A steel rope link (20) (Figure 20) is attached between the other end of the spring (21) and a pulley holder (19). A steel rope (17) is attached to a fixing point (25) at one end and the other end is passed around the pulley (19) then through the guide (16), through one hole (15) in the raised edge of the base unit (1), head end, through the handle (14), and back through the second hole (15) in the raised edge of the base unit (1). The loose end of the rope (17) is then attached to itself just above the guide (16) using a steel rope clamp (Figure 16). When the handle (14) is not in use it is pushed into retaining grommets (15) on the raised edge. When used, the handle (14) is pulled out, which in turn pulls on the rope (17). The rope (17) pulls on the pulley (18) which causes the spring (21) to stretch. This allows the pulley (18) to travel towards the head of the base unit (1). The handle (14) will pull out for a distance of approximately 1 metre and two stops on the rope (17) will prevent the rope (17) travelling any further. When the handle (14) is released, the spring (22) retracts, pulling back the pulley (18), which in turns pulls back the rope (17), which pulls the handle (14) back to the base unit (1) to within 100 mm. This allows the handle (14) to be used again on the same emergency incident. The handle (14) has a gripping cover fitted.

Figures 23 to 28 show a fourth embodiment in which fold-away lifting handles are provided on the head and side of the base unit (1). For each handle (26), (27) two turning pivots (29) are fitted to the upright edges of the base unit (1), held by two threaded washers and a locking ring. In the outward protruding part of the pivot (29), a slot has been cut to provide part of a hinged connection with a handle (26 or 27). Each handle (26), (27) consists of two lengths of flat bar and one round bar with its ends ground flat. The elements are riveted together to allow

for the handle (26), (27) to fold away against a retaining bracket (30) or be raised in a parallelogram linkage as shown in Figures 24 and 25.

Figures 29 to 33 illustrate how skids may be operated by fold-away handles constructed generally as in Figures 23 to 28. Instead of connecting the handle (27) to the base unit (1) by a rotating pivot (29), the pivot is replaced with a skid bar (31). The skid bar (31) is made of solid steel bar turned down at one end "B" leaving a lip. End "A" is slotted as was the pivot (29). End "A" of the skid bar (31) is fitted with a welded-on washer on the outside of the base unit (1). End "B" is held in position with a saddle bracket (33) with a split bush (32) fitted around the turned section of the skid bar (31) and held in position by the saddle (33) and the lipped end of the skid bar (31). Fitted to the skid bar (31) is a shaped nylon skid (31A). A section of the base plate of the base unit (1) is cut out to allow the skid (31A) to protrude through the base unit (1) when the handle (27) is raised. Figures 29, 30 and 32 show the skid (31A) when in use and Figures 31 and 33 show the skid (31A) retracted. To operate the skids (31A), the handle (27) is pulled upright. As the handle (27) turns, the skids (31A) are turned so that they protrude below the base unit (1) through the four holes cut in the base of the base unit (1), which allows the base unit (1) to be pulled along the floor. The leverage of the handle (27) being pulled upright forces the skids (31A) down.

In a fifth embodiment of the invention, stowage means are provided for the webbing straps and handles of Figures 2, 6 and 8. The webbing handles (4), (5) are folded against the upright edges of the base unit (1) and held in position with plastic pull-apart clips (34). When the handles (4), (5) are pulled, the plastic clips (34) will snap, releasing the handles (4), (5). The reason for the plastic clips is so that the webbing handles (4), (5)

cannot get entangled with the base unit (1) or the bed base (8) during normal bed-making which may make it difficult to use the handles (4), (5) when required in an emergency.

Figures 39 to 43 show an alternative method of storage of a handle assembly similar to that of Figures 23 to 28. The retractable side handles consist of steel round bar bent into a "U" shaped handle (35) with a slot cut into each end (38). Fitted to each end of each handle (35) is an extension bar (36). One end of the extension bar (36) is cut to form a protruding stud (38). On the other end of the extension bar (36) a threaded stop nut (37) is fitted. A slide block (39) is made from a block of metal with two clearance holes drilled into it to allow handle sections (35), (36) to slide through. Two clearance holes are also drilled on the upright edges of the base unit (1). The slide block (39) is fitted in the base unit (1) in line with the holes in the upright edges of the base unit (1) and secured with screws. The handle (35) legs pass through the holes in the upright edges of the base unit (1) and through the holes in the slide block (39). The extension bars (36) with the stops fitted (37) are married to the handle (35) legs with a pin or rivet forming a joint (38). Figure 40 shows the handle (35) when not in use, with the handles (35) retracted. Figure 39 shows the handle (35) pulled out for use.

Figures 44 to 46 show another modification to the side handles, which are spring-loaded side handles. Each handle (35) is a metal bar bent into a "U" shape with its two ends slotted (38) into a protruding stud (40), which is made of round metal bar. One end of the stud (40) is turned down and screw-threaded and the other end is cut to form a protruding section (38). A leaf spring (41) is riveted on the underside of one leg of the handle (35). Two clearance holes are drilled in the upright edge of the base unit (1). The threaded ends of the studs (40) are

passed through the holes in the upright edge of the base unit 1 and secured with locking nuts (40). The handle (35) and the studs (40) are married up and secured with a pin(s) or rivets to form pivot joints (38). Figure 44 shows the handle (35) as it would be held down with the weight of the mattress (7) depressing the spring (41). Figure 45 shows the handle (35) as it would be if the mattress (7) were lifted; the spring (41) has been released, lifting the handle (35) clear of the bed base (8), allowing the handle to be grabbed.

Figures 47 to 55 illustrate how the apparatus can be used by one person to rescue a patient. As a permanent fixture to the hospital bed (8), a rail assembly (Figure 54) comprises two runner guides (42), which are kept at the correct distance apart by three metal spacing bars (42a). The spacing bars (42a) at each end of the rail assembly (Figure 54) extend beyond the outer edges of the rubber guides (42). The outward extension portions of the spacing bars (42a) are used to fix the rail assembly (Figure 54) onto the bed base (8). On each runner guide (42) a moving latch (43) is fitted (Figure 53). Fitted to the base unit (1) are four studs comprising two activating studs (45) and two stopping studs (46). The two activating studs (45) are fitted one each side of the foot end of the base unit (1). Two stopping studs (46) are fitted one each side at the head end of the base unit (1). Also fitted to the base unit (1) are runners or wheels. The two running guides (42) are fitted onto the surface of the bed base (8) approximately one third in from each side of the bed base (8). The two moving latches (43) are fitted to the outside raised edge of each runner guide (42) near the foot end of the bed base (8). The moving latches (43) are bolted to the runner guides (42) incorporating spring washers which will allow each moving latch (43) to move under pressure from the activating stud (45). The operating sequence is that the patient is secured in the rescue unit as described in Figures 1 and 2. As the vast majority of

medical beds can be raised and lowered, the bed base (8) is lowered to its minimum height, which varies from bed type to bed type between 30 cm and 45 cm. When the bed base (8) is at its lowest level, the handle (3) at the foot end of the base unit (8) is used to pull the rescue unit along the bed base (8). The runner guides (42) keep the base unit (1) running straight along the bed base (8). As the base unit (1) travels along the runner guides (42), the activating studs (45) makes contact with end (a) of the moving latches (43) forcing down end (a) of the moving latches (43) and forcing up end (b) of the moving latches (43). The base unit (1) continues to travel forwards until the stopping studs (46) make contact with the end (b) of the moving latches (43) bringing the rescue unit to a stop. The moving latches (43) are prevented from moving as the flat edges on the moving latches (43) are forced into contact with the bed base (8) when the activating studs (45) force down ends (a) of the moving latches (43), see Figure 52. The foot end of the rescue unit is lowered to the floor as shown in Figure 49. The operator goes to the head end of the rescue unit and lifts it off the bed base (8) and over the moving latches (43) using the lifting handles (3). Once the rescue unit is on the floor he uses the pulling handle at the head end whichever type is fitted (4), (10), (14), (27). The rescue unit will move easily across any type of floor covering, including concrete and tarmac.

As an alternative (not illustrated) to the moving latches (43) which are present to prevent the entire rescue unit from being pulled from the bed while the nurse or rescue attendant single-handedly pulls the unit from the foot end (see Figure 49) the bed base unit (8) or runner guides (42) may be provided with fixed upstanding stops generally in conformance with the schematic illustration of the moving latches (43) in Figures 49 and 50. Outstanding detents near the head end of the base unit (1) project outwardly into engagement with the fixed upstanding stops,

still as illustrated in Figure 4. The nurse or other operative then has to lift the head end, using the handle (3) up and around the fixed stops until the base tray (1) and patient can be lifted to the floor as illustrated in Figure 50. Advantageously however upward pressure on the handle (3) at the head end actuates a linkage (not shown) to withdraw the outstanding detents, so that all the nurse has to do is to support the patient's weight and continue the sliding movement to lift the patient to the floor.

Figures 56 to 62 show various design methods to accommodate runners/wheels and different ways of making the base unit (1) rigid. Figure 56 shows the top hat (2) method as described in the previous drawing description. Base units (1) fitted with skids can be used without any wheels or other runners. Figure 57 shows a base unit (1) excluding the top hat (2) but with a folded base tray (1A) to make it rigid. Holes are cut in the base of the base tray (1A) near each corner of the base tray (1A) to accommodate roller ball transfer units (see Figure 57A).

Figure 58 shows a base tray (1) with a top hat section (2) fitted. Four holes are cut into the base of the base tray (1) one near each corner. The holes are of a size to allow wheels (Figure 58A) to protrude through them. A box section is fitted over each hole on the inside of the base tray (Figure 58A). The wheel housings are fitted to the top of the box section on the inside. The wheels will protrude below the base of the base tray (1), see Figure 58A. Figure 59 shows a base unit (1A) excluding top hat section (2). The base tray (1A) has been folded to make it rigid. The way the folds are put into the base tray (1A) allow the wheels to be fitted directly onto the raised edges folded into the base of tray unit (1A), see Figure 59A. Figures 57 and 59 do not require top hat sections (2) to be fitted as the way the folds are put into the base tray (1A) make them rigid in the longitudinal direction. Lateral rigidity of the base units of all embodiments of



Figures 56 to 59 is achieved by means of welded end plates as illustrated in Figure 60.

Figure 56A shows a skid type runner made of metal, nylon, plastic, etc. fitted on the underside of base unit (1) at each corner as shown in Figure 61. Figure 57A shows a ball transfer unit that will run in any direction fitted to the base unit at each corner as shown in Figure 62. Figures 58A and 59A show fixed and swivel type wheels fitted to the base unit at each corner as shown in Figure 62.

The preferred embodiments of the invention described above have been shown used with a three-part sectional mattress (7). There will now be described embodiments of the invention which, although suitable for use with one-piece or three-part mattresses, are the preferred embodiments for use in hospitals using single-part mattresses.

The construction of a preferred embodiment of a rigid base tray of the emergency evacuation apparatus of the invention is illustrated in Figures 63 to 67, of which Figures 63 to 65 illustrate the three individual components of the base tray, and Figures 66 and 67 illustrate the assembled base tray. The base tray comprises a bottom panel (1A), which has upturned flanges around two of its long sides and its foot, but not around its head end. The bottom panel (1A) is made more rigid by the insertion of a top hat reinforcement section (2) which is a sheet of metal folded to form the required shape and rivetted or spot-welded to the bottom panel (1A). Over the top is provided a flat top sheet (1B) which is also formed from folded sheet metal and which has four downwardly extending flanges closely adjacent to its long edges and its head and foot ends, to cooperate with the upstanding flanges of the bottom panel (1A). These flanges are fastened together by means of rivets or spot-welds, the rivet holes being shown in Figures 63 to

65. The assembled base tray (1C) is similar to the tray (1A) of Figure 1 except that it has a planar top surface.

Figures 68 to 71 illustrate the mounting of the base tray (1C) of Figures 63 to 67 on the hospital bed. The top surface (48) of the hospital bed base (8) is wider than the base tray (1C) and is built up to approximately the same height as the base tray along opposite edges by folded metal side panels (47). Figure 70 shows those panels (47) displaced laterally outwardly from the base tray (1C) for illustrative purposes, although in use they are secured to the top surface (48) of the bed base (8), closely alongside the base tray (1C) as shown in Figure 69. Figure 69 also shows a small overlap between a top flange of the base tray (1C) and the side panels (47). If desired the longitudinal top edge of each side panel (47) could be recessed (not shown) to accommodate this flange and render the upper surface of the bed completely flat and planar.

Figure 76A illustrates the provision of carrying handles (3), lifting straps (5) body-securing straps (6) and a pulling handle (4). Figures 72 and 73 illustrate the stowage of the pulling handle (4), which in use is releasably attached to an upstanding detent (49) mounted on the top surface (48) of the bed base (8). The releasable connection between the pulling handle (4) and the detent (49) may be by means of a hook and pile fastener such as that sold under the Registered Trade Mark VELCRO, as illustrated in Figure 73. In Figure 73 the right-hand half of the Figure illustrates the condition of the pulling handle (4) relative to the detent (49) when the base tray (1C) is in its normal position on the hospital bed, and the left-hand half of the Figure illustrates how the pulling handle (4) becomes taut around the detent when the base tray (1C) is moved to its intermediate position as shown in Figure 75. Figure 74 illustrates another quick release fastening for the

pulling handle (4), in which a central tubular portion (52) of the pulling handle (4) is received in spring clips (53) in the detent (49).

Figures 77 to 79 illustrate how the base tray (1C) is provided with gliders, wheels or roller balls respectively. These raise the bottom surface of the base tray (1C) high enough so that on rolling the base tray (1C) down the bed to the position shown in Figure 75, the base tray does not foul the detent (49).

CLAIMS

1. An emergency evacuational apparatus for removing a bed-ridden patient from a bed in an emergency situation, comprising a rigid base tray that is strong enough to support the weight of an adult patient while maintaining its rigidity, the tray having a width which is approximately that of an adult body and a length which is substantially equal to a mattress length; wheels, glide members, roller balls or castors on the base tray to facilitate its movement over the floor; and straps anchored to the base tray for wrapping around the mattress to draw the mattress around the patient to restrain and cocoon the patient in an emergency evacuation situation.
2. Apparatus according to claim 1, wherein the straps are provided with snap-fit couplings which permit them to be connected together to encircle the mattress and patient prior to tightening them to draw the mattress around the patient.
3. Apparatus according to claim 1 or claim 2, wherein a restraining mechanism is provided to latch the apparatus, on sliding the base tray down the bed, in an intermediate position in which the rigid base tray tips with its foot end resting on the floor and its head end resting on the foot end of the bed.
4. Apparatus according to claim 3, wherein the restraining mechanism comprises a flexible web of a pulling handle which normally is stowed beneath the rigid base tray as it lies on the top surface of the bed.
5. Apparatus according to any preceding claim, wherein the rigid base tray has a width less than that of the bed from which the patient is to be evacuated, and is longitudinally slidable in a channel created in the upper mattress-supporting surface of the bed, so that the upper

surface of the bed is substantially flat and planar when the base tray is in position.

6. An emergency evacuational apparatus for removing a bed-ridden patient from a bed in an emergency situation, substantially as described herein with reference to Figures 1 to 62 of the drawings.

7. An emergency evacuational apparatus for removing a bed-ridden patient from a bed in an emergency situation, substantially as described herein with reference to Figures 63 to 79 of the drawings.



Application No: GB 9806990.9  
Claims searched: 1-7

Examiner: L.V.Thomas  
Date of search: 17 July 1998

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.P): A5X (X20)  
Int Cl (Ed.6): A61G 1/00, 1/003, 1/007, 1/01, 1/02, 1/04, 1/044, 1/048  
Other: Online: WPI, CLAIMS

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2182570 A (WISE) see p.1 ll.22-69 and 108-118 and p.2 ll.3-7	1-4
A	GB 2030047 A (ANGLIA SAFETY) see p.1 ll.71-89 and 119-130	1
A	WO 81/00672 A1 (HEMCO INDS.) see abstract	1
Y	US 5473784 (NIXON ET AL.) see col.3 l.24 - col.4 l.6	1-4
X,Y	US 4186453 (BURNS ET AL.) see col.1 ll.34-41 and col.2 ll.13-68	1-4

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.  
& Member of the same patent family

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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(72) and (74) continued overleaf

(54) Abstract Title

**Emergency evacuation apparatus for a bed-ridden patient**

(57) The apparatus comprises a rigid base tray 1 of a length substantially equal to that of a mattress, wheels, glides, rollers or castors on the tray to facilitate its movement over the floor and straps 6 anchored to the tray for wrapping around the mattress to thereby restrain and cocoon the patient. Lifting handles 3 and lifting straps 5 may be provided and a pulling handle 4 of webbing, or a rigid, extensible handle (10), may also be included. The lifting handles may be of fold-away type and the pulling handle may be auto-retractable.

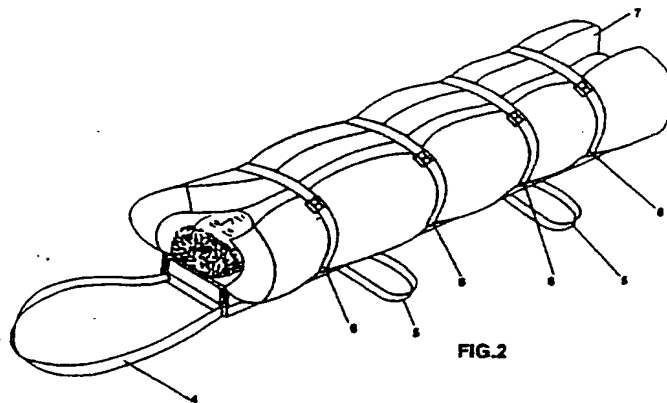


FIG.2

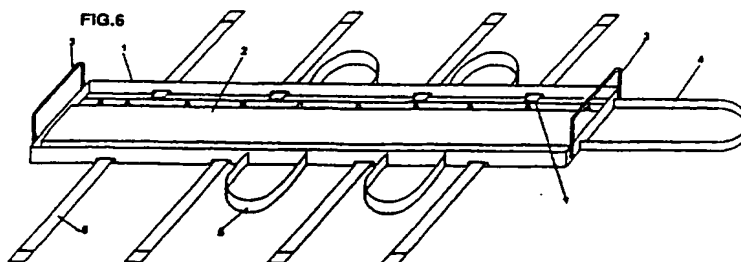


FIG.6

GB 2 324 738 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.  
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